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# Subacute Care in Skilled Nursing Facilities as an Adaptive Response to the New Healthcare Environment

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy
at Virginia Commonwealth University

By

Shu-Chuan Jennifer Yeh

M.S., University of Scranton, 1990
B.A., National Taipei College of Nursing, 1987

Director: Thomas T.H. Wan, Ph.D.
Professor and Chairman
Department of Health Administration

Virginia Commonwealth University
Richmond, Virginia
October, 1997

SCHOOL OF ALLIED HEALTH PROFESSIONS
DEPARTMENT OF HEALTH ADMINISTRATION
VIRGINIA COMMONWEALTH UNIVERSITY

This is to certify that the dissertation prepared by Shu-Chuan Yeh, *Subacute Care in Skilled Nursing Facilities as an Adaptive Response to the New Healthcare Environment,* has been approved by her committee as satisfactory completion of the dissertation requirement for the degree of Doctor of Philosophy.

Committee:

Thomas T.H. Wan
*Director of Dissertation*
*School of Allied Health Professions*

RE Hurley
*Committee Member*
*School of Allied Health Professions*

Dolores G. Clement
*Committee Member*
*School of Allied Health Professions*

James W Begun
*Committee Member*
*School of Allied Health Professions*

Martha Neff-Smith
*Committee Member*
*School of Nursing, Hygiene, and Public Health*
*Johns Hopkins University*

Cecil B Drain
*Dean, School of Allied Health Professions*
*(or Dean's Representative)*

Jack L. Haar
*Dean, School of Graduate Studies*

December 16, 1997
(Date)

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# LIST OF ABBREVIATIONS

| | |
|---|---|
| American Health Care Association | AHCA |
| Acquired Immune Deficiency Syndrome | AIDS |
| Area Resource File | ARF |
| Average Length of Stay | ALOS |
| Commission on Accreditation of Rehabilitation Facilities | CARF |
| Certificate of Need | CON |
| Diagnosis-related Groups | DRGs |
| Durbin-Watson Statistic | DW |
| For Profit | FP |
| Full-time Equivalents | FTEs |
| Generalized Least Squares | GLS |
| Health Care Financing Administration | HCFA |
| Home Health Agencies | HHAs |
| Health Maintenance Organization | HMOs |
| International Subacute Healthcare Association | ISHA |
| Joint Commission on Accreditation of Healthcare Organizations | JCAHO |
| Licensed Practical Nurses | LPNs |
| Managed Care Organizations | MCOs |
| Minimum Data Set | MDS |
| Nurse Assistant | NA |

| | |
|---|---|
| Nursing Facilities | NFs |
| Not- For-Profit | NFP |
| Nursing Home | NH |
| National Subacute Care Association | NSCA |
| Omnibus Budget Reconciliation Act | OBRA |
| Online Survey Certification and Reporting System | OSCAR |
| Ordinary Least-Squares | OLS |
| Provider of Services | POS |
| Prospective Payment System | PPS |
| Routine Cost Limits | RCL |
| Registered Nurses | RNs |
| Skilled Nursing Facilities | SNFs |
| Seemingly Unrelated Regression | SUR |
| Tax Equity and Fiscal Responsibility Act | TEFRA |
| Time Series Cross-Section Regression | TSCSREG |
| Total Eternal Nutrition | TEN |
| Total Parental Nutrition | TPN |

# ABSTRACT

## SUBACUTE CARE IN SKILLED NURSING FACILITIES AS AN ADAPTIVE RESPONSE TO THE NEW HEALTHCARE ENVIRONMENT

By Shu-Chuan Jennifer Yeh, Ph.D., R.N.

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

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Major Director: Thomas T.H. Wan, Ph.D.
Professor and Chairman
Department of Health Administration

Facing new challenges and opportunities in the changing healthcare environment, skilled nursing facilities (SNFs) will adopt new strategies to assure their survival. One important strategy is to increase the provision of subacute care. The aim of this study was to understand changes in the provision of subacute care by SNFs. Trend analysis was used to quantify the recent growth of subacute care in SNFs, and hypotheses were developed to explain the level of subacute care provided by SNFs.

The analysis uses data from 1992 through 1995 involving 1,471 subacute care nursing facilities each year, with the individual nursing home as the unit of analysis. Data were obtained from the Online Survey Certification And Reporting System (OSCAR) Long-Term Care File, Provider of Services (POS) File, Area Resource File (ARF), Harrington et al.'s data, and the Bureau of the Census. SAS/STAT and SAS/ETS

computer programs were used to analyze the data. Descriptive and time series cross-section regression analyses were conducted to answer the research questions and to test the hypotheses.

This study found that nursing homes increased subacute care services from 1992 through 1995. Hospital-based nursing facilities provided higher percentages of the subacute care beds than freestanding nursing homes. However, freestanding nursing homes grew more quickly than hospital-based nursing facilities. Metropolitan area, Medicaid reimbursement, ownership, SNF type, number of physicians, number of ancillary staff, and the ratio of RN to LPN were related to the level of subacute care services. CON/moratorium and chain affiliation were associated with level of subacute care for hospital-based nursing facilities.

# CHAPTER 1
# INTRODUCTION

## The Study Problem

Two noted consequences of paying hospitals according to diagnostic related groupings (DRGs), as does the prospective payment system (PPS), are that lengths of stay and costs may be reduced. A potential adverse effect of the PPS, however, is that providers may discharge patients too early in order to reduce costs. It is believed that the Medicare PPS reimbursement has forced hospitals to transfer sicker and more disabled patients to nursing homes in order to meet PPS reimbursement guidelines for length-of-stay (Gornick and Hall, 1988; Gaumer and Stavins, 1992; Manton, Woodburg, Vertrees, and Stallard, 1993). Those "quicker and sicker" discharged patients may need subacute care or continuing care in nursing homes. These phenomena imply that the resource demands on nursing homes will increase, and that the number of subacute care patients in nursing homes will increase.

Besides PPS, the growth of managed care stimulates the search for lower-cost alternatives to hospital acute care. Thus, managed care may foster the development of more subacute care services. With the growth of the managed care market, many facilities are receiving an influx of subacute patients.

Medicare is the largest third-party payer of subacute services. The percentage of total Medicare payments that went to skilled nursing facility services increased from 1.8 percent in 1990 to 3.4 percent in 1993 (HCFA, 1995). The Medicare payment policies

for post-acute care offer incentives to provide subacute care services, which will increase both the demand for, and the supply of subacute care.

Certificate of need (CON) regulations or moratoria on new construction are another important environmental factor that affects subacute care. Many states require firms to meet CON regulations before the construction and development of a new subacute facility or the implementation of a new subacute program. Hence, CON or construction moratoria are barriers to the growth of subacute care.

Other factors, however, stimulate the demand for subacute care. New technology improves the survival probabilities for sick people and also transforms some acute care diseases into chronic diseases. As a result, the demand for subacute care and long-term care will substantially increase. Multi-dimensional services have become popular in the health care environment; health care providers are offering different service mixes to satisfy their patients' needs. Nursing homes have had to assess their service mixes to decide whether they will include physical, occupational, or speech therapies, as well as laboratory, pharmacy, oncology, and radiology services.

Facing changes in their environments, skilled nursing facilities will adopt new strategies, such as changing their patient mix, intensive care, technology, personnel, and reimbursement, to maintain their survival. Providing subacute care is one of the SNFs' options for retaining their critical resource, patients.

Subacute care is more intensive than traditional long-term skilled care, but less intensive than acute medical care and acute rehabilitation (Zimmer, Eggert, and Brodows, 1988). Subacute care is a bridge between acute care and long term care. Thus, it is believed that subacute care services are playing an important role in integrated

delivery systems. The profit margin in subacute care facilities is around 15% (Pallarito, 1992; Zinn and Mor, 1994), so not only freestanding SNFs, but also hospital-based SNFs will compete for the subacute care markets. Whether or not the skilled nursing facilities add subacute care services depends on their financial, manpower, and on other important resources.

Since subacute care falls between acute care and traditional long-term care, a critical policy issue is the relationship between the hospital industry and the nursing facilities industry. That relationship is uncertain. Subacute care offers opportunities for long-term care providers and hospitals to develop effective joint venture arrangements and integrated delivery systems. As subacute care becomes the point of integration between the hospital and the nursing facility industries, policy debates arise concerning the appropriate site of subacute care, CON requirements, licensure requirements, and Medicaid reimbursement.

This study applies resource dependence theory (Pfeffer and Salancik, 1978) to examine the responses of SNFs in caring for subacute care patients. The resource dependence perspective emphasizes that organizations cannot generate all the resources to accomplish their tasks; instead, they must interact with their environment or with other organizations to acquire resources. The availability of the resources, the importance of the resources, and the extent to which the resources are controlled determine an organization's dependence.

When care in nursing homes becomes increasingly intensive with the demand for subacute care, and the scarcity of related sources becomes more severe, different levels of responses will be considered in order to survive in the nursing home industry. From

reviewing the literature, many studies can be identified that examine the demand for and supply of nursing homes in general (Greene and Ondrich, 1990; Henry, 1990; Kenney and Holahan; 1991; Nyman, 1989). However, few researchers have focused on nursing homes' provision of subacute care for the patients in need (Lagoe and Decker, 1991: Zinn and Mor, 1994).

## Purpose of the Study

The purpose of this study was to examine the participation of SNFs in caring for subacute care patients. Few of the existing research studies on skilled nursing facilities are related to subacute care, and estimates of the potential development of subacute care in skilled nursing facilities are based on limited sample sizes. To date, no longitudinal study has examined changes in the level of subacute care in SNFs after implementation of the PPS revisions of reimbursement for subacute care, and other environmental changes. Using the perspective of dependence theory, this study analyzes the relationships among factors that affect the volume of subacute care offered by SNFs.

## Research Questions

The following research questions are addressed by this study:

1. Have subacute care services increased over the 1992-1995 period?
2. What impact have environmental factors had on the level of subacute care services offered by SNFs?
3. What types of SNFs have developed more subacute care?

## Theoretical Framework

The theoretical framework for this study is based on the resources dependence perspective (Pfeffer and Salancik, 1978). The assumption of resources dependence theory is that organizations cannot generate internally all the necessary resources to accomplish their tasks. They must interact with the environment in order to obtain resources to survive. The need to acquire resources creates dependencies between organizations and external units. Organizations strive to maintain their autonomy and identity by stabilizing their resources. The organizations may enter into exchange (or interdependent) relationships to acquire the necessary resources and to reduce uncertainty. This theory emphasizes the limits or constraints that the environment imposes on an organization's ability to adapt.

Figure 1 depicts the conceptual framework for this study. Environmental factors include implementation of PPS, the growth of managed care, new technology, aging population, multi-dimensional services competition, reimbursement changes by Medicare, Medicaid, and managed care, and CON regulations or moratoria on new construction. These factors affect the stability of resources for nursing homes, which thereby adapt their responses to the uncertain environment.

## Hypotheses

The following hypotheses are based on the literature review and the theoretical framework:

H1: SNFs in metropolitan areas have a higher percentage of subacute care beds

than SNFs in non-metropolitan areas.

H2: SNFs in states with active CON programs or moratoria on new construction have a lower percentage of subacute care beds than others.

H3: Chain affiliated SNFs have a higher percentage of subacute care beds than independent SNFs.

H4: SNFs that participate only in Medicaid have a lower percentage of subacute care beds than other SNFs.

H5: For-profit SNFs have a lower percentage of subacute care beds than not-for-profit SNFs.

H6: Hospital-based SNFs have a higher percentage of subacute care beds than freestanding SNFs.

H7: SNFs with more physicians per 100 beds are associated with higher percentages of subacute care beds.

H8: SNFs with more ancillary staff per 100 beds are associated with higher percentages of subacute care beds.

H9: SNFs with a higher ratio of RNs to LPNs are associated with higher percentages of subacute care beds.

## Scope and Approach

This section describes the scope of the research and the analytical approach used to arrive at the empirical results.

## Scope

This study was a longitudinal study with the individual skilled nursing facility as the unit of analysis. The study analyzes different providers caring for subacute care patients, namely freestanding nursing homes, hospital-based skilled nursing homes, rehabilitation hospitals distinct part unit, long-term care hospitals, and hospital swing beds. The definition found in Banaszak-Holl, Zinn, and Mor's article was used to define the total of subacute care beds, including number of beds in caring for acquired immune deficiency syndrome (AIDS), dialysis, disabled children, head trauma, hospice, Huntington's, special rehabilitation, and ventilator/respiratory use (Banaszak-Holl, Zinn, and Mor, 1996).

This research used four years of data, from 1992 through 1995. The study population averages around 16,000 nursing homes for each year and includes all SNFs that had one or more subacute care beds at least one year of the study period. The resulting sample was comprised of 1,471 nursing facilities. Four years of observations for these facilities resulted in a total of 5,884 observations. The OSCAR long-term care file furnished the primary data for the dependent variable in this study. The second data source was the Provider of Services (POS) file. These data were used to test seven hypotheses. The third data source was the 1996 Area Resource File (ARF), with information on local market areas. The ARF file was merged with OSCAR data to test one hypothesis. Data on the status of CON Programs and state policies for construction moratoria and average occupancy rates at the state level for nursing homes were from the reports by Harrington and Swan (1996) and Harrington, Carrillo, Thollaug, and Summers

(1997). The data on CON/moratoria were merged to the OSCAR file to test one hypothesis. Data on aging population (over 65 years old) were from the Bureau of the Census.

## Analytical Approach

This research was a longitudinal study with descriptive and multivariate analyses. The descriptive analysis includes means and standard deviations. Trend analysis including both graphical and regression methods was performed to discover whether the time variable has a statistically significant effect on the growth of subacute care services. SAS/STAT software was used to analyze these tests.

The multivariate analysis of the data was performed using time series cross-section regression analysis. The study used a variance components model and a seemingly unrelated regression (SUR) model to examine the relationships among environmental factors and the level of subacute care services. The variance components model can adjust for the problems of autocorrelated error from a single time series equation and nonconstant error variance from a single cross-sectional equation. The SUR model assumes that all regressors are independent variables, but uses the correlations among the errors in the different equations to improve the regression estimates. The time series cross section regression analysis is performed by SAS/ETS software.

## Significance of the Study

Findings from this study provide salient formation to health policy-makers, nursing home providers, and third party payers. Exploring the growth of subacute care services reveals implications for both the costs and the quality of nursing home care. There is considerable debate about the effects of subacute care on overall health care costs. Previous studies have found that subacute care is billed at 40 to 60 percent less than the billing for acute care in the hospital (Burns, 1993; DHHS, 1995; Hartwell, 1994; Stahl, 1995). This study found that not-for-profit (NFP) nursing homes have a higher percentage of subacute care beds. Since NFP nursing homes are subject to the constraint of profit maximization, the results of this study suggest that the development of subacute care may be mission-driven, rather than a response to reimbursement incentives. The findings of this study may assist policy makers in evaluating how well nursing facilities are integrating acute care and long-term care.

This research also examined the relationships between environmental factors and nursing homes' subacute care services. The results of the study provide information on important indicators influencing the growth of subacute care services, which can be compared with the literature on the demand for and supply of subacute care services. Such comparisons have policy implications for nursing facilities and their management of subacute care patients. The results also may affect the decisions of new providers about entering the subacute care market.

Data on several health care professions are included in this study; thus, the findings may suggest how subacute care providers could rearrange their staffing mix.

These professionals include the physician, registered nurse, licensed practical nurse, physical therapist, occupational therapist, registered dietitian, speech pathologist, pharmacist, and social worker. This study includes freestanding nursing homes, hospital-based nursing facilities, rehabilitation hospitals distinct part unit, long-term care hospitals, and hospital swing beds in the analyses. The inclusion of different subacute care providers allows them to distinguish themselves from each other in terms of service mix.

Finally, this study developed and tested a theoretical framework for analysis of the nursing home market. By using resource dependence theory to test nursing homes' adaptive responses, the study adds empirical evidence to the knowledge base for organizational theory.

## Summary of Remaining Chapters

The following chapters present the related empirical and theoretical literature, the theoretical framework used to established the analytical model, and the methodology used to analyze data.

Chapter 2 presents an overview of subacute care, focusing on the current definitions, scopes of services, demands, staffing, reimbursement, and regulations. The term “subacute care” is now used to refer to patients whose needs fall somewhere between acute hospital care and “traditional” long-term nursing facility care. Subacute care services include transitional, general, chronic, and long-term transitional subacute care. Each category has its own characteristics, as described in Chapter Two. There is no

single, agreed-upon definition of subacute care, although several health care associations and accreditation organizations have developed formal definitions.

The scope of subacute care services changes across different categories, and can be distinguished as either "rehabilitation subacute" or "medical subacute." The former is more rehabilitation services such as physical, occupational, and speech therapies; the latter requires more intensive medical and nursing care. In general, the most common programs in subacute care services are rehabilitation, "medically complex", and wound care.

The demand for subacute care is not easily estimated because of the absence of a specific, agreed-upon definition of subacute care. In three published studies, estimates of the current annual volume of the subacute care market range from 1.2 to 8.1 million days (CARF, 1994; Cowen and Company, 1993; Ting, 1995). Among the factors that may influence the growth of subacute care are the new Medicare reimbursement policies for subacute care providers, the efforts of managed care providers to find less costly services, the preferences of physicians, the development of new technologies to prolong a patient's life, and the increase in the aging population.

Several resources are needed for high acuity care: physical plant features such as a distinct unit, and better trained staff including physicians, registered nurses, and ancillary staff. Financial performance is critical for the SNFs' survival, because SNFs usually are small organizations that are vulnerable to their environments. Subacute care providers are seeking a different payer mix to improve their financial performance. Medicare reimbursement for post-acute care on a facility-specific, cost-related basis has increased the profit margins for post-acute providers. The Medicare payment and coverage policies

for SNFs also contain strong incentives for the nursing homes providing traditional long-term care to offer more skilled care and therapies. Managed care organizations seeking lower costs alternatives may encourage the growth of subacute care. Thus, managed care plans may become major payers for subacute care providers in the future.

Subacute care can be provided by many different institutional providers, including freestanding SNFs, hospital-based SNFs, rehabilitation hospitals, distinct-part rehabilitation units, and long-term care hospitals. Placement of patients in a subacute care setting can be decided by the insurance company, by the physician, or the patient. The literature shows that about 25 percent of current subacute capacity is in a hospital setting (Ting, 1995). A hospital-based SNF can share the hospital's current equipment without building a new facility. Such SNFs use excess acute capacity and have more staffing than freestanding SNFs. From a resource dependence perspective, hospital-based SNFs own the important and scarce resources, so they may adapt more quickly than freestanding SNFs.

Regulations such as CON requirements or moratoria directly affect the supply of subacute care. From a review of the literature, it is apparent that the lack of CON requirements has encouraged the development of subacute care. With CON requirements there are likely to be fewer subacute care beds. Other important regulations, Medicare requirements and the Omnibus Budget Reconciliation Act (OBRA), also affect the subacute care market.

Chapter 3 presents the theoretical framework and hypotheses. Resource dependence theory (Pfeffer and Salancik, 1978) is used as the theoretical framework for this study. The idea of the resource dependence theory is that organizations interact with

their environments in order to exchange or obtain necessary resources. The importance of the resource, the availability of the resource, and the concentration of the resource determine an organization's dependence.

The study hypotheses are derived from the literature review and the theoretical framework. Since many environmental situations influence the resources and dependent relationships of nursing homes, nursing homes may choose to offer subacute care services in order to improve their chance for survival. The environmental factors affecting nursing homes include becoming part of multi-facility organizations, applying for Medicare certification, participating in different reimbursement systems, changing ownership, adjusting staffing patterns, and so on.

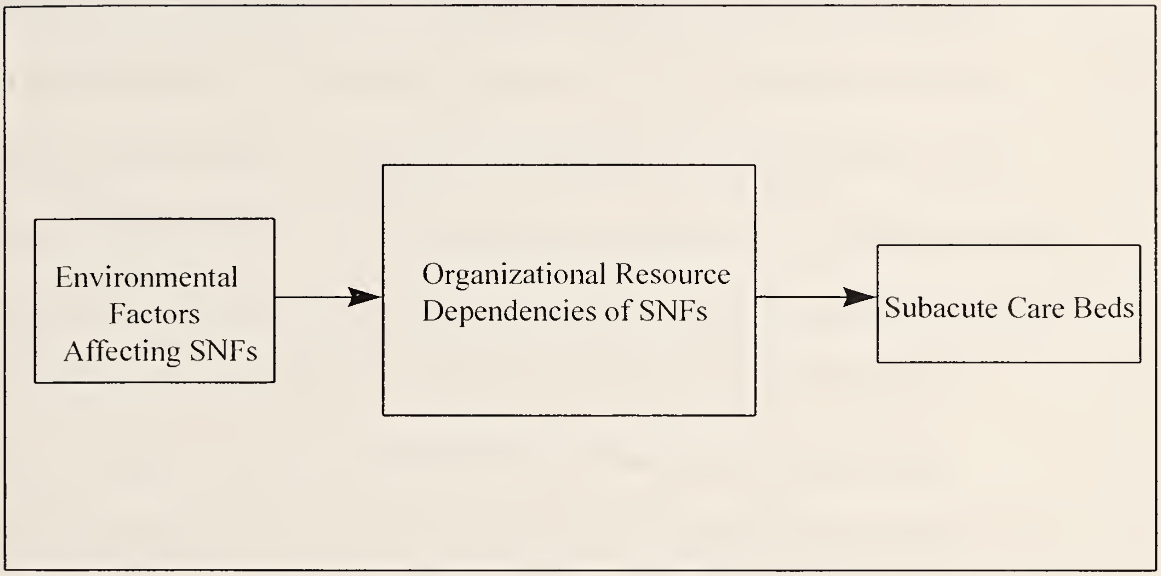
Chapter 4 presents the study methodology: the research design, the unit of analysis, the sampling plan, measurement, data sources, and data analysis plans. This study is a longitudinal study with the individual skilled nursing facilities as the unit of analysis. The data sources include the OSCAR long-term care files; POS files; Area Resource File (ARF); the Bureau of the Census; and Harrington et al.'s reports. The analysis strategies include descriptive analysis, trend analysis, and time series cross-section regressions.

Chapter 5 describes the empirical results of this study. Trend analysis indicates that subacute care beds grew continuously in different models over the four-year period. Results of the time series cross-section regression analysis include the variance components model and the seemingly unrelated regression (SUR) model. The variance components models show that ten independent variables are statistically significantly associated with the level of subacute care services in the full model. For the hospital-

based model, six independent variables are important indicators for the level of subacute care services. The SUR model presents similar results to the variance components models. Overall R-square in the SUR model is greater than in the variance components model.

Chapter 6 discusses the empirical results in view of the theoretical framework and related hypotheses. The results support several hypotheses. The chapter also discuss the study's limitations, the implications for policy, and suggestions for future research.

Figure 1. The Conceptual Framework of the Study


Environmental Factors Affecting SNFs
Organizational Resource Dependencies of SNFs
Subacute Care Beds

# CHAPTER 2
# REVIEW OF THE LITERATURE

Several research areas that are important to the study are reviewed in this chapter. The first section describes health care trends related to subacute care services. The second section presents the definitions of subacute care services made by different organizations or associations. The third section discusses the scope of subacute care services. The fourth section discusses the demand for subacute care, and the fifth section, its staffing. The sixth section describes the reimbursement for subacute services. The seventh section discusses the choice of destination after acute care and the factors affecting the choice. The last section examines the influence on subacute care of regulations including CON, moratoria on new construction, Medicare requirements, and the OBRA.

## Introduction and Background

In response to rising expenditures for inpatient hospital care in the Medicare program, Congress passed the Social Security Amendments of 1983. These amendments changed the method of reimbursement to hospitals for treating Medicare beneficiaries from a retrospective, cost-based system to a PPS based on diagnosis-related groups (DRGs). In other words, PPS pays hospitals a fixed payment amount according to each category of medical condition treated.

With the implementation of DRG-based reimbursement, the incentives faced by hospitals changed dramatically. For-profit hospitals may find it in their interest to adjust

their case mix of Medicare beneficiaries by encouraging the admission of patients whose cost of treatment is below the PPS reimbursement level, and by discouraging the admission of those for whom the cost of treatment exceeds the reimbursement level (Hurley, Linz, and Swint, 1990). In addition, Medicare discharges and length of stay declined significantly after the introduction of the PPS (Carroll and Erwin, 1987; DesHarnais, Chesney, and Fleming, 1988; Fitzgerald, Fagan, and Tierney, 1987; Gaumer and Stavins, 1992; Guterman et al., 1988; Manton ct al., 1993; Mayer, Buckly, and White, 1990). Another important result was that the use of skilled nursing facilities and home health care increased after PPS was implemented (DesHarnais et al., 1988; Guterman et al., 1988; Kenney and Holahan, 1990). The shifting of patients from hospitals to nursing homes was shown by a sicker population of patients in nursing homes, requiring more extensive and intensive treatments in the post-PPS period (Buchanan, 1996; Carroll and Erwin, 1987; Kanda and Mezey, 1991; Kenney and Holahan, 1991; Neu and Harrison, 1988; Stears, 1991; Steiner and Neu, 1993). The literature also shows a trend after PPS to shift subacute care patients into SNFs (Carroll and Erwin, 1987; Evans et al., 1990; Fitzgerald et al., 1987; Kahn et al., 1990; Kane & Kane, 1995; Ray et al., 1990; Roger et al., 1990).

Medicare payment policies for post-acute care have encouraged the growth of subacute care providers. Medicare reimburses subacute care providers on the basis of each facility's costs; this payment system, combined with the PPS incentive to hospitals to discharge patients quickly from acute care, has created both a strong demand for subacute care and an increasing supply of subacute care providers (DHHS, 1995). Medicare is the largest third-party payer of subacute services. From 1990 through 1993,

total annual Medicare revenues to nursing facilities were $1.8 billion, $2.3 billion, $3.1 billion, and $4.4 billion, respectively (HCFA, 1995; Monroe, 1994). The percent of the total Medicare that went to skilled nursing facilities rose constantly, from 1.8 percent in 1990 to 3.4 percent in 1993 (HCFA, 1995).

Not only did the Medicare payment system for acute care, but also the growth of managed care increased the demand for subacute care. The growth of managed care may foster the development of more subacute care, as the managed care providers seek lower-cost alternatives to hospital acute care (DHHS, 1995; Fowler, 1992). Medicare managed care plans that offer expanded hospital benefits to attract beneficiaries have incentives for the managers to shift the beneficiaries to SNFs to reduce their cost risk (DHHS, 1995). Moreover, commercial insurers looking for less costly alternatives to hospitals for beneficiaries with AIDS or brain injuries now contract directly with subacute care providers (LaRiccia, 1988; Mason, 1992; Pallarito, 1992).

New technology is another factor in the blossoming of subacute services. Changes in technology and the treatment protocols for certain medical conditions have increased the demand for long-term care alternatives. For example, the availability of life-extending drugs is transforming AIDS from an acute to a chronic disease (Freeman, 1988; Mason, 1992). Similarly, the increased chances for survival of head trauma victims have created a need for appropriate post-hospitalization alternatives (LaRiccia, 1988). Facilities that care for large numbers of special needs patients may decide to group them together in separate units to obtain volume-related efficiencies and to develop a high level of expertise among staff (Lariccia, 1988; Manson, 1992).

Medicaid reimbursement has had an indirect impact on subacute care, as providers have looked for other sources to increase their revenue. Medicaid is the major payer for nursing homes; but because Medicaid's reimbursement rate is lower, nursing homes look for other sources to of revenues. One of their strategies is to give private patients first priority in admission to skilled nursing facilities. Private patients pay a higher price and thus make more profit for nursing homes; the Medicaid reimbursement rates established by state governments are lower, so the nursing homes allocate very few beds to Medicaid patients (Weissert and Musliner, 1992). Another response is to increase subacute care services in order to improve their financial status. A detailed description of subacute care reimbursement is presented in a later section of this chapter.

Subacute care is the fastest growing component of long term care. There are 10,000 - 15,000 subacute beds in nursing facilities (Burk, 1994). Several studies suggest that 20 percent to 40 percent of acute care hospital patients are potential candidates for subacute programs in nursing facilities (Burk, 1994; Monroe, 1994). To handle the increasing number of subacute care patients, skilled nursing facilities will have to change the scope of their services, expanding them to include medical subacute and rehabilitation subacute services such as physical, occupational, and speech therapies, as well as laboratory, radiology, and pharmacy services. Subacute care is more intensive than traditional long-term skilled care, but less intensive than acute medical care and acute rehabilitative care (Zimmer et al., 1988).

The demand for subacute care services is growing with the increasing numbers of individuals who are aged and ill. The age of the population in the U.S. has been increasing rapidly. The aged population (65 and over) was 11 percent of the total

population in 1978, but grew to 12.8 percent in 1996 (U.S. Bureau of the Census, 1996). The percentage of the total population aged 85 and over increased from 1.0 in 1978 to 1.4 in 1996 (U.S. Bureau of the Census, 1996).

To summarize this section, several environmental factors have influenced the subacute care markets. After the introduction of PPS, Medicare discharges and length of stay declined in the acute care facilities and the use of SNFs and home health care increased. The sicker population was shifted from acute care hospitals into nursing homes more quickly. The new Medicare reimbursement policies for subacute care and the low Medicaid reimbursement policies have influenced nursing homes to change their service mix to meet the demand for subacute care. Managed care pursues the lower cost alternatives and fosters the development of subacute care. New technology for treating certain medical conditions increases the chances for survival, thereby creating more need for subacute care. The growing population of elderly changes in disease patterns, and advances in treatment escalate the demand for subacute care. These environmental changes affect nursing homes' patient resources, equipment resources, human resources, and so on.

## Definitions of Subacute Care

Several organizations have prepared definitions of subacute care, which are surveyed in this section. The American Health Care Association (AHCA) and the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) agree on a joint definition of subacute care:

" Subacute care is comprehensive inpatient care designed for someone who has an acute illness, injury, or exacerbation of a disease process. It is goal-oriented treatment rendered immediately after, or instead of, acute hospitalization to treat one or more specific active complex medical conditions or to administer one or more technically complex treatments, in the context of a person's underlying long-term conditions and overall situation.

Generally, the individual's condition is such that the care does not depend heavily on high-technology monitoring or complex diagnostic procedures. Subacute care requires the coordinated services of an interdisciplinary team including physicians, nurses, and other relevant professional disciplines, who are trained and knowledgeable to assess and manage these specific conditions and perform the necessary procedures. Subacute care is given as part of a specifically defined program, regardless of the site.

Subacute care is generally more intensive than traditional nursing facility care and less than acute care. It requires frequent (daily to weekly) recurrent patient assessment and review of the clinical course and treatment plan for a limited (several days to several months) time period, until the condition is stabilized or a predetermined treatment course is completed (AHCA, 1995; JCAHO, 1994)."

The International Subacute Healthcare Association (ISHA) defines subacute care as follows:

"Subacute care is a comprehensive and cost-effective inpatient program for patients who have had an acute event as a result of an illness, injury, or exacerbation of a disease process; have a determined course of treatment; and do not require intensive diagnostic and/or invasive procedures. The severity of the patient's condition requires physician direction, intensive nursing care and significant utilization of ancillaries, and an outcome-focused interdisciplinary approach utilizing a professional team to deliver complex clinical interventions (medical and/or rehabilitation). Typically short term, the subacute level of care is utilized as an inpatient alternative to an acute care hospital admission or as an alternative to continued hospitalization (ISHA, 1994)."

In Griffin book, the National Subacute Care Association (NSCA) also has definition for the subacute care:

"Subacute care patients are sufficiently stabilized to no longer require acute care services but are too complex for treatment in a traditional nursing center. Subacute care centers and programs typically treat patients who present rehabilitative and/or medically complex needs and require physiological monitoring.

Subacute care patients may require:
- Treatment and/or assessment of the care plan by physician;
- Nursing intervention of more than 3 hours per day;
- Therapy services (i.e., physical therapy, occupational therapy, speech therapy,

respiratory therapy, psychosocial)
- The need for ancillary or technological services (i.e., laboratory, pharmacy, nutrition, diagnostic, DME)
- Utilization of case management/coordination services
- Individuals at the subacute level of care are most effectively and appropriately served by an outcome-oriented interdisciplinary treatment process. Subacute care programs are focused on outcomes of functional restoration, clinical stabilization or avoidance of acute hospitalization and medical complications.

A subacute level of care can be provided in a variety of settings, including skilled nursing facilities, acute hospitals and specialty hospitals. The objectives and goals of subacute care are the cost-effective and creative use of health care resources to achieve maximal outcomes (Griffin, 1995)."

Despite the attempts of AHCA, JCAHO, ISHA, and NSCA to define subacute care, there remains a great deal of perplexity about exactly what subacute care is. A major reason for the confusion is that there are four categories of subacute care (Griffin, 1995). Individual providers tend to focus on just one or two of those four categories.

(1) *Transitional subacute care* can be described as a short stay (5 to 30 days) with high nursing acuity (5.5 to 8.0 hours per patient day) (Knapp, 1995). This type of subacute care unit or facility serves as a hospital step-down entity and results in a significant reduction of acute hospital days (ISHA, 1994). For example, stroke patients may be transferred to a transitional subacute unit on the fifth day of hospitalization in an acute care hospital. Another example is that coronary bypass patients who are not off the ventilator within 4 to 5 days may be transferred to a subacute unit for a weaning program (Taft, 1995). A transitional subacute facility is used as a substitute for continued hospital stays, not as an alternative placement after hospital discharge. Hospital-based skilled nursing facilities are in this category (Griffin, 1995).

(2) *General subacute care* is a category for patients who require medical care and monitoring at least weekly, short-term nursing care of approximately 3.5 to 5.0 hours per patient day, and rehabilitative therapies of from 1 to 3 hours per patient day (Griffin, 1995). The general subacute care patients usually need to stay 10 to 40 days and require subacute rehabilitation or certain subacute nursing services (Knapp, 1995). For example, a patient needs intravenous therapies for a septic condition, but has no other significant medical complications (Griffin, 1995). Although there is some overlap in clinical programs between the transitional subacute units and general subacute care facilities, the key difference is the acuity level of the patients. The goal of both transitional and general subacute units is to manage the patient's recovery or rehabilitation in a cost-effective way and to discharge the patient to home or to a less expensive level of care, such as long-term care or assisted living.

(3) *Chronic subacute care* is given patients with little hope of ultimate recovery or functional independence, for example, ventilator-dependent patients, long-term comatose patients, and patients with progressive neuralgic disease. Such patients require nursing staff at the level of 3 to 5 hours per patient day; medical monitoring biweekly to monthly; and restorative therapies, usually provided by nursing staff with guidance from rehabilitation therapists (Griffin, 1995). The average length of stay is 60-90 days (Knapp, 1995). These patients either may eventually be stabilized, be cared for in a long-term care facility, or die.

(4) *Long-term transitional subacute care* facilities often are licensed as hospitals rather than as nursing facilities. They are PPS-exempt as long-term care hospitals and have average lengths of stay of 25 days or more (Griffin, 1995). Because their patients

are in hospitals, attending physicians may visit the patients daily. The nursing staff are primarily registered nurses, and nursing hours per patient day range between 6.5 and 9.0, depending on the types and acuity levels of patients (Knapp, 1995). A summary of all four categories is listed in Table 1.

Table 1
Summary of Subacute Care Categories

| | Transitional Subacute Care | General Subacute Care | Chronic Subacute Care | Long-term Transitional Subacute Care |
|---|---|---|---|---|
| Length of Stay | 5-30 days | 10-40 days | 60-90 days | >= 25 days |
| HPPD[a] | 5.5-8.0 | 3.5-5.0 | 3.0-5.0 | 6.5-9.0 |
| Facilities | Hospital-Based | Freestanding | Freestanding | Is licensed in hospital |
| Type of Patient | Medically complex: surgery recovery, cardiac recovery, pulmonary management, oncology recovery, diabetes, renal disorders | Medicare patients requiring rehabilitation or nursing services without other major medical complications | Little hope of functional independence | High acuity patients |
| Number of Doctor Visits | 3-7 times weekly | Weekly | Semi-monthly or Monthly | Daily |
| Examples | *Stroke patients<br>* Ventilator during weaning | *IV therapy for septic condition, with no other complication | *Ventilator-dependent<br>* Long-term Comatose<br>* Progressive neurological disease | * Acute ventilator-dependent<br>* Medically complex |

[a]: HPPD is hours per patient day.

Sources: 1. Griffin, K.M. (1995), Handbook of Subacute Health Care, p. 6-7.
2. Anders, K.T. (1994), Is Subacute Care Right for You? Contemporary Long Term Care, 17(6), p. 34

To summarize this section: the AHCA, JCAHO, ISHA, and NSCA have attempted to define the subacute care. Generally, the four organizations define subacute services to include rehabilitation and medically complex services that are currently provided in an institution. However, these definitions are not specific for subacute care,

because the categories are diversified and an institution may serve only one or two categories of patients.

## Scope of Subacute Care

The scope of subacute care services changes by category. According to Altieri (1995), the most common programs in subacute care services are rehabilitation (90%), medically complex care (81%), and wound care (77%). Two-thirds of the facilities surveyed reported providing respiratory care, though only about half of those designated ventilator care as one of their respiratory services. Pulmonary services were considered a major growth area. Over 80 percent of the responding facilities said they provided services for hip fracture, wound care, and amputations, and over 90 percent provided physical rehabilitation and stroke care (Altieri, 1995). Not only care for the medical conditions just noted, but also services for medically complex care are included in subacute care. For example, infusion therapy such as continuous peripheral intravenous therapy with or without medication, chest percussion and postural drainage, post-operative care, tube feeding, apnea monitoring, tracheotomy care and suctioning, dialysis care, decubitus care, ileostomy and fistula care, wound care, total parental nutrition (TPN), total eternal nutrition (TEN), antibiotic therapy, pain management, and hydration therapy are involved in the subacute care services (Griffin, 1995; Murer & Brick, 1995).

Other studies in the literature include some of the following areas in subacute care categories: AIDS, cancer, spinal cord injury, infectious disease, dialysis, pressure ulcer, hospice, and Alzheimer's disease patients (Brooks, 1994; Burk, 1994; Burns, 1993; DeLorme, 1989; Hyatt, 1995; Kelly, 1992; Pallarito, 1992). One study includes 7 areas

of care items in a subacute care unit: AIDS, dialysis, disabled children, head trauma, hospice, Huntington's, and special rehabilitation (Banaszak-Holl, Zinn, and Mor, 1996). Another study divides subacute rehabilitation care into short term, intermediate, and long term categories (Table 2) (Burns, 1993). Table 2 shows the length of stay for short term rehabilitation care to be 3 to 30 days; the short term category represents 75 percent of the total number of rehabilitation patients.

Table 2
Categories of Subacute Rehabilitation Care

| Category | Short term | Intermediate | Long term |
|---|---|---|---|
| Length of Stay | 3 to 30 days | 31 to 90 days | 91 to less than two years |
| Treatment Needs: | | | |
| Medical/nursing | Low to moderate | Moderate | Low to high |
| Rehabilitative therapy | Moderate to high | Moderate to low | Low to moderate |
| Model of care | Interdisciplinary programs | Services/programs | Services/programs |
| Types of Patients | Medically complex and/or Rehabilitative therapeutic needs<br>Good potential for functional and/or medical condition improvement | Medical and rehabilitative diagnosis<br>Frail, slow progress for functional improvement | Medical and/or rehabilitative catastrophic diagnoses<br>Slow/limited progress for vital but minimal functional gains |
| Demand Estimate | 75% | 22% | 3% |

Source: Hillhaven Corp.
Note: Adopted from Burns, J., "Subacute care feeds need to diversify," Modern Healthcare, 23(50): p. 35.

Currently, subacute services are diversified in their scope; nonetheless, they can be consistently distinguished between "rehabilitation subacute" and "medical subacute." "Rehabilitation subacute" refers to patients with orthopedic conditions, such as hip fracture, spinal cord injuries, and head injuries (DHHS, 1995; Kane & Kane, 1995). These patients tend to require more of such rehabilitation services as physical, occupational, and speech therapies. Conversely, "medical subacute" patients tend to need

intensive medical and nursing care, but fewer other therapies (Anders, 1996; DHHS, 1995). These patients include those with cardiovascular diagnoses, cancer, and those needing ventilator care, wounds care, or intravenous (IV) therapy (Hegland, 1993).

In brief, studies may vary in what they include among subacute care services. The most common programs in subacute care services include "rehabilitation subacute care" and "medically subacute care." "Rehabilitation subacute care" patients need more rehabilitation services such as physical, occupational, and speech therapies. In contrast, "medical subacute" patients require intensive medical and nursing care, but fewer other therapies. The present study drew on Banaszak-Holl et al.'s (1996) listing of seven items as subacute care services in a nursing home: AIDS, dialysis, disabled children, head trauma, hospice, Huntington's, special rehabilitation, and ventilator/respiratory care.

## Demand for Subacute Care

Excess demand is a pervasive characteristic of nursing home markets. One study suggests that the national shortage is around 250,000 beds (Richardson, 1990). In part, the excess demand for beds may result from CON legislation and construction moratoria aimed at controlling Medicaid expenditures, as well as from policies that do not encourage alternatives to nursing homes (Davis and Freeman, 1994). Generally, nursing homes have high occupancy rates. Research on nursing home use and bed supply has presented evidence that the high occupancy rate in itself indicates the likelihood of excess demand (Davis and Freeman, 1994; Harrington, Swan, and Grant, 1988). A study from 1988 shows the market to be segmented: for those patients who pay with private funds,

the demand for care is fully met, but patients whose care is paid for public funds obtain only the number of beds remaining after private demand has been satisfied (Nyman, 1988). A study from 1996 has dissident findings on the nursing home occupancy rate, showing that census in nursing homes is now fluctuating, particularly with the growth of managed care market (Pultman, 1996).

Although excess demand is common in the nursing home market, nursing home providers are facing increasing competition in multi-dimensional services. Skilled nursing facilities are developing specialized programs for certain types of patients, such as a special unit for Alzheimer's disease patients (Grant, Kane, and Stark, 1995). Skilled nursing facilities are expanding their services to include therapies, laboratory, and pharmacy services, in addition to traditional nursing care.

The estimated demand for subacute care is not easily measured, because of the absence of specific, agreed-upon definitions of subacute care and subacute care programs. Three published studies estimate that the current annual volume of the subacute care market may range from 1.2 to 8.1 million days (CARF, 1994; Cowen & Company, 1993; Ting, 1995). The wide range reflects the variety of subacute care definitions. In a DHHS study (1995), the authors review three published estimates of the current potential annual volume of subacute care. They found that the estimates of subacute care patient days vary from 21.9 million to 48.2 million patient days (Table 3). The variation of the estimated demand is due to the three studies using different groups of subacute care providers and different methods to analyze different data sources.

Another factor promoting the demand for subacute care is the growth of managed care. In the last ten years, enrollment in managed care plans has increased dramatically

among employees covered under private insurance, as well as among Medicaid and Medicare beneficiaries. Total enrollment in managed care plans has grown from 6.0 million enrollees in 1986 to more than 67.5 million enrollees in 1996 (Figure 2).

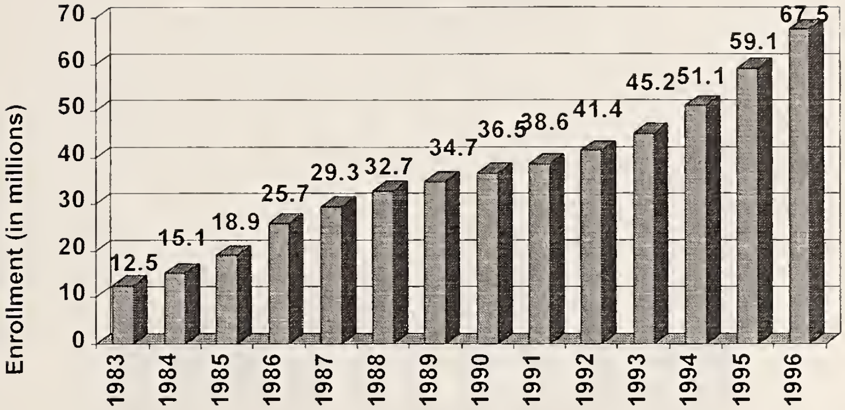
Table 3.
Three Published Estimates of the Current Potential Annual Volume of Subacute Care

| Author | Ting/CCHI | Miner and Hicks | Sherman and Walker |
|---|---|---|---|
| Year | 1994 | 1992 | 1991 |
| Volume Patient Days (million) | 21.9 | 24.1-48.2 | 26.1-30.2 |
| Revenue (Billions) | 10.4 | 10-20 | 8.3-9.5[a] |
| Identified subacute care providers | Freestanding and Hospital-based SNFs; Long-term hospitals | Freestanding and Hospital-based SNFs; Long-term hospitals | Freestanding SNFs |
| Methods of analysis | Analysis of hospital discharge data for Seattle market; applied diagnosis and procedure information by age to national census data | Estimate that 10 % - 20% of acute care general hospital use is appropriate for subacute | Analysis of Medicare claims data and expert panel to identify appropriate diagnoses and potential substitution for current hospital acute care. |

Sources:
1. DHHS (1995), Subacute Care: Policy Synthesis and Market Area Analysis, Lewin-VHI.
2. Sherman and Walker (1994), Subacute Care in Freestanding Skilled Nursing Facilities: An Estimate on Savings to Medicare, Abt Associates.
3. Ting, H. (1995), Subacute Care Analysis of the Market Opportunities and Competition, Nursing Home.
4. Miner and Hicks (1993). The Post-Acute Specture of Care, Cowen and Co.

[a]: To better compare the Sherman and Walker estimates to the others, DHHS applied the estimates of the proportion of the potential subacute care volume that is Medicare (65% - 75%) to their estimates of the potential subacute care volume for the Medicare program in 1991 (2.9 million patient days, $6.2 billion in revenues), to calculate the total potential volume for all payers.

Figure 2. Growth of HMO Enrollment.1983-1996

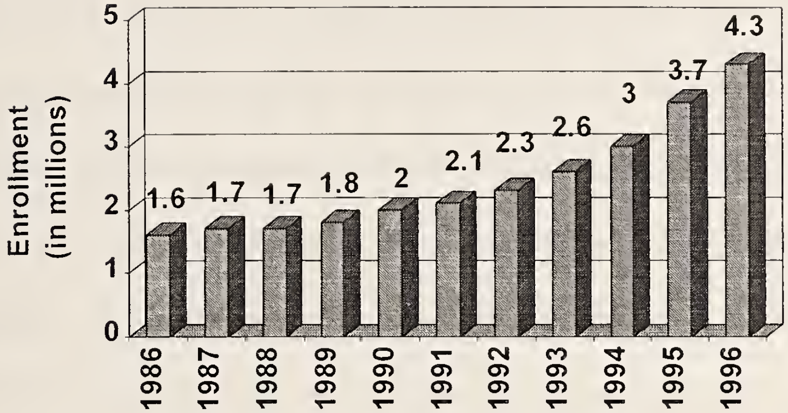


Sources: 1. Group Health Association of America: Patterns in HMO Enrollment, 1992.
2. 1992 HMO Market Position Report.
3. GHAA's National Directory of HMOs database (1988-1994).
4. American Association of Health Plans (AAHP), Number of People Enrolled in HMOs, 1976-1996.

Enrollment of Medicare beneficiaries under Medicare risk contracts has also grown rapidly, from 1.6 million in 1986 to 4.3 million in 1996 (Figure 3). That accounts for 11.2 percent of all Medicare beneficiaries.

As managed care enrollment grows, competitive pressures on HMOs to seek less costly alternatives to hospital acute care increase as well. Studies have found that most of the estimates of the cost of institutional subacute care are between $300 and $550 per day, while hospital costs are $700 to $1,000 per day (Brooks, 1994; DHHS, 1995). The subacute care industry has developed strategies to meet the increasing demand for subacute care, incorporating some advances in medical technology that allow to complex services to be provided in skilled nursing facilities (Rutishauser, 1994; Sloane, 1995).

Figure 3. Growth of Medicare Managed Care
Enrollment in HMOs
1986-1996[a]



[a] Includes only enrollees in Medicare Risk Contracts
Source: HCFA Office of Managed Care and the Bureau of Data Management and Strategy. Health Care Financing Review, Medicare and Medicaid Statistical Supplement, 1996.

Many post-acute care providers are providing rehabilitation and skilled nursing care to patients with more medically complex and less stable conditions.

A study by Sherman and Walkers for the California Association of Health Facilities (CAHF) found that over 87 percent of the nursing homes surveyed had 100 beds or fewer dedicated to subacute care (Sherman and Walkers, 1994). Well over half reported plans to expand subacute beds by at least 25 percent over the next five years, and nearly half would add programs during that period (Altieri, 1995). According to Ting, subacute care accounts for 75 percent of the nursing home market and is likely to continue to predominate (Ting, 1995). For example, a metropolitan area of one million people will need 6 average size (about 30-bed) subacute units. In that geographic area, there might be 38 SNFs, 4 rehabilitation hospitals, and 21 other DRG-exempt specialty

hospital units, that is, a total of 63 facilities (not including the acute general hospital) may exist to meet a need for 6 subacute units (Ting, 1995).

To summarize this section: there is excess demand for nursing homes. Several studies have estimated the demand for subacute care, but it cannot be accurately assessed because the studies have identified different types of subacute care providers and used different methods to analyze the demand. Some used acute care hospital discharge data, and others used Medicare claims data. The samples in the studies, too, were different. One factor that has promoted the growth of subacute care is managed care. Competition through multi-dimensional services is another factor. Other factors are described in later sections of this chapter.

## Staffing

Subacute care staff commonly provide rehabilitation services such as orthopedic, stroke, head injury, and neuromuscular/neuralgic rehabilitation. Subacute units also offer rehabilitation for amputees and patients with arthritis, spinal cord injuries, and severe pain (Burk, 1994). Medical treatments are provided in subacute units for respiratory conditions, wound management, simple and complex intravenous (IV) administration, post-surgical care, dialysis, complex care due to comorbidity, cancer, and infectious disease. According to the characteristics of the subacute care, different professional staff are needed.

## Nurse Staffing

Due to the complexity of care required, nursing services must be administered by professional staff with experience in acute care. Thus, staffing becomes a big challenge for subacute care facilities. Nurse staffing includes registered nurses, licensed practical nurses, and nurses' aides. The nurses should have high skill levels, including training in the latest technology such as ventilators and infusion therapy, knowledge about pharmacology, and experience in recognizing and treating symptoms associated with multiple system involvement (Hyatt, 1995).

Quality of nursing care and the levels of nurse staffing in subacute care facilities are critical concerns of public policy. Previous research has shown that higher ratios of RNs are related to better outcomes for the patients including fewer pressure sores, less functional decline, and higher rates of discharge to the community, as well as fewer survey deficiencies for facilities (Cherry, 1991; Johnson-Pawlson and Infeld, 1996; Mezey and Lynaugh, 1989; Munroe, 1990; Small and Walsh, 1989). Total nurse staffing has also been shown to be related to functional improvement and to a higher score for quality of care (Johnson-Pawlson and Infeld, 1996; Spector and Takada, 1991). Studies concerned with the increasing acuity of nursing home residents (Hughes, 1993; Munroe, 1990) found positive, significant relationship between nursing home quality and the ratio of RN hours to LPN hours per resident day. Yet, according to the Institute of Medicine (IOM), around 71 percent of the nursing care in nursing homes is provided by unskilled personnel (Wunderlich, Sloan, and Davis, 1996). Nursing homes use few professional registered nurses to provide nursing care (Zinn, 1993). Moreover, Ullmann (1985) found

that the effect on facility costs of providing of high quality nursing care is statistically not significant (Ullmann, 1985). Therefore, when nursing homes change their case mix to subacute care patients with higher intensity medical conditions, they should recruit nurses with recent subacute care experience or nurses currently working in an acute care hospital.

The subacute human resources management standard by JCAHO requires that all professional personnel who provide patient care in the subacute program are currently licensed or otherwise authorized by the state to practice, have a defined scope of practice, and are competent to provide the services that the organization allows them to provide (JCAHO, 1994). Thus, all organization personnel should meet the legal requirements of licensure, certification, and/or registration for their occupations in accordance with applicable law and regulation. Also, staff are required to receive in-service programs and to attend educational programs to ensure that they have current clinical information about the care of patients in a subacute program (JCAHO, 1994).

Unlike freestanding SNFs, the hospital-based subacute SNFs can share or select qualified nurses from their own hospitals. To be cost-effective, staff need to be flexible and open to fulfilling multifaceted roles, by sharing the responsibilities of subacute care (Hyatt, 1995). If the census in the subacute care units fluctuates greatly, or if the number of patients requiring specific services varies, contract staff is the least costly way for the management decision to staff (Griffin, 1995; Shukla, 1983). High use of agency staff raises the cost of care and can harm the quality of care (Shukla, 1983). Continuity of care is achieved by having consistent staffing within the unit. This can be most cost-effective

when patient care is provided by staff who are employed by the institution and involved daily with the coordination and delivery of care (Knapp, 1995; Shukla, 1982).

## Physicians

In the late 1970s, physicians made up fewer than 1 percent of all nursing home employees, and most worked on a contractual or fee-for-service basis (Johnson and Grant, 1985). Today, there are promising signs that physicians are assuming more active roles in nursing homes. The growth of subacute care as an alternative to hospitalization has resulted in a population of nursing home residents with greater medical needs than ever before (Frotinsky and Raff, 1996). These medical needs require physicians' attention.

Medical director and attending physician are the principle roles fulfill in nursing home care. In the only recent study of medical directors to report demographic characteristics, Orgren, Miller, and Beck (1994) found that most respondents from California nursing homes (N=386) were male (94%), Caucasian (87%), and middle-aged (mean=53 years). Demographic characteristics of physicians who serve as attending physicians to nursing home residents have not been studied. Several studies have confirmed that medical directors each tend to work in only one nursing home, with responsibility for a limited number of patients; a small number of attending physicians are responsible for a disproportionately large number of nursing home residents (Orgren, Miller, and Beck, 1994; Zimmer, Watson, and Levenson, 1993). Core activities of the medical director include the following: review of and participation in the formulation of patient care policies, infection control guidelines, and pharmacy protocols; provision of

in-service education to other staff; and attendance at utilization review committee meetings (Fortinsky and Raff, 1996). The medical director is also responsible for coordinating periodic visits from attending physicians and other specialists such as podiatrists, dentists, and psychiatrists (Levenson, 1993). The medical director plays a major part in ensuring the care of nursing home residents.

The attending physician's role in a nursing home often begins before the patient enters, particularly if a patient has been hospitalized. In the hospital, the nursing home's attending physicians may be asked to perform a preadmission assessment of psychosocial and functional status, including severity of physical, mental, and cognitive impairments (Fortinsky and Raff, 1996). Once the patient is in the nursing home, the attending physician is expected to provide ongoing care along with other nursing home staff.

Physician involvement is an essential part of subacute care. Skilled nursing facilities need to develop the close relationships with their physicians in order to have them visit subacute care patients regularly. Due to the rapid changes among subacute patients, specialty physicians should direct medical and rehabilitation programs. For example, subacute programs caring for patients with brain injury or head trauma need consulting neurologists. A specialist in infectious disease should be available for patients with iatrogenic infections such as hospital-acquired pneumonia, complex wounds, or urinary tract infections, or those with infections and complex multi-system disease (Griffin, 1995). Other medical specialists consulting in a subacute program might include cardiologists, orthopedists, neurologists, physiatrists, rheumatologists, hematologists, urologists, oncologists, endocrinologists, gerontologists, psychiatrists,

radiologists, and dermatologists. Whether they serve as attending physicians or as consultants will depend on how many times they see the patients in subacute care units.

## Ancillary Services Staff

Ancillary service staff are also needed in subacute services. Ancillary staff include physical therapists, occupational therapists, speech pathologists, pharmacists, and social workers. The number of ancillary staff will be determined by the type and number of patients. For example, if the general subacute program admits mostly patients with a stroke and brain injury, speech-language pathologists should be key members of the team (Knapp, 1995). The speech-language pathologist is also an integral member of the team in a ventilator weaning program. On the other hand, if most of the patients have orthopedic diagnoses with short-term rehabilitation, speech-language pathologists will not be needed except by contractual arrangement as necessary.

The employment of social workers in nursing home services is growing, not only because hospitals are releasing patients more quickly, but because a large and growing number of them have impairments or disabilities. Medical social workers are important in a subacute program, to develop and maintain counseling and support groups for patients and families, and to help prepare the family as well as the patient for the patient's discharge to the community or to another level of care. Quality and continuity of care will be achieved if the discharge program, which connects subacute care with either long-term care or home health care, is well defined. In general subacute programs with many orthopedic rehabilitation patients with short stays, the social worker is occupied primarily

with discharge planning, which includes arranging for coordinated services in the home and for outpatient care (Griffin, 1995).

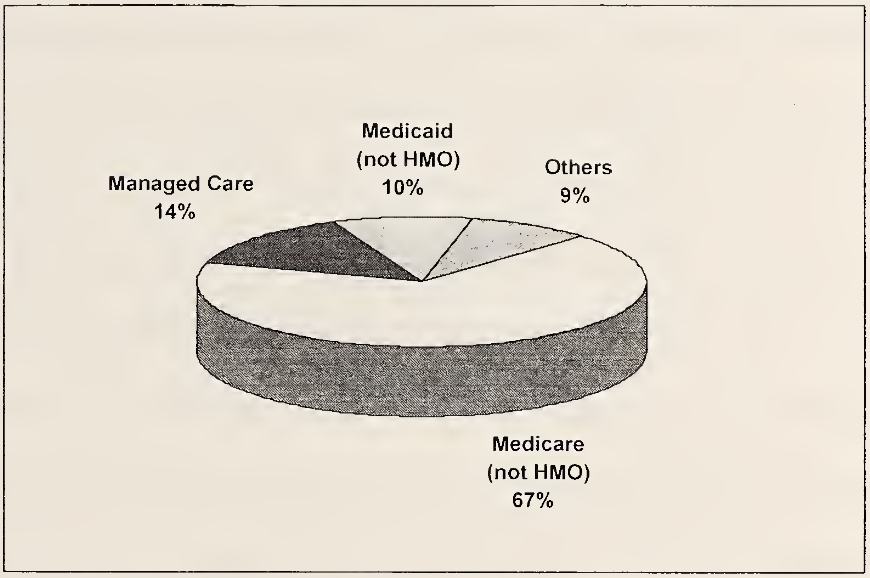
To summarize this section: staff must have experience in caring for subacute care patients. The literature shows that nursing home quality is positively related to the ratio of RN to LPN hours per resident day. Thus, when a nursing home changes its patient mix to a higher acuity level, the proportion of registered nurses should be increased in order to maintain its quality of care. Whether to recruit contracting nurses, part-time nurses, or full-time nurses will depend on the nursing home management. Due to the complexity of care, physician involvement is an essential element of subacute care. Depending on the need of the subacute care patients, either attending physicians or contracting physicians may provide treatments. Ancillary staff also may become primary members of the subacute care team. Medical social workers design discharge programs to help subacute care patients as they are discharged to the community or another level of care.

## Reimbursement of Subacute Care

Reimbursement policies are the major factor driving the increasing demand for subacute care. Subacute care is billed at 40 percent to 60 percent less than the billing for acute care in the hospital (Burns, 1993; DHHS, 1995; Hartwell, 1994; Stahl, 1995). Medicare continues to be the major payer for subacute care services, but AHCA reports managed care and private payers accounting for up to 20% of their reimbursement (Figure 4) (AHCA, 1996). Medicare is more likely to consider some form of bundled payment, which combines coverage for hospital and post-hospital care, rather than a

special rate for subacute care (Kane & Kane, 1995). Such bundling could also achieve better accountability for the outcomes of hospital care, by assessing the joint contribution of hospital and post-hospital care (Kane & Kane, 1995). This section describes Medicare reimbursement and managed care reimbursement.

Figure 4. Estimated Subacute SNF Payer Mix



Source: American Health Care Association Survey of Subacute Care Providers, 1996

## Medicare Reimbursement

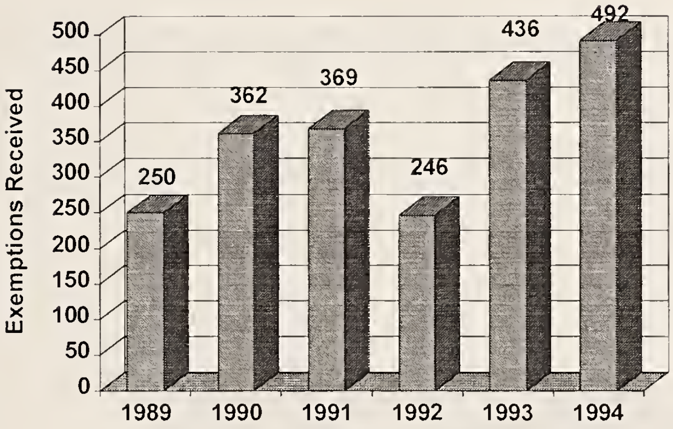
Medicare reimbursement recognizes three components: routine costs, ancillary costs, and capital costs. Routine costs are those costs for routine services: the regular room, dietary, and nursing services; minor medical and surgical supplies; medical social services; psychiatric social services; and the use of equipment and facilities for which a separate charge is not customarily made (HCFA, 1995).

If a hospital has not owned or operated skilled nursing facility beds within the past three years, then new-provider status can be obtained for a newly established, hospital-based, subacute skilled nursing facility (HCFA, 1995). New-provider status exempts the hospital-based subacute skilled nursing facility from the routine cost limits (RCL) and allows it to be reimbursed for reasonable costs for three years (Griffin, 1995). Lewin-VHI studies have found that because many hospital-based SNFs are newer and still under their 3-year exemption, and they are likely to be higher-cost and to serve mostly Medicare fee-for-service patients (DHHS, 1995). Between 1989 and 1994, the number of new-provider exemptions rose from 250 to 492 (Figure 5).

In addition to the three years of cost-based reimbursement, hospital-based skilled nursing facilities may be cost-based for the start-up year if the start-up year does not comprise a full twelve months (HCFA, 1995). After the cost-based reimbursement period the RCL apply, unless the hospital requests and is approved for an exception to them. Any skilled nursing facilities that are not established under an acute care hospital's program have to deal from the outset with Medicare’s Routine Cost Limit exceptions process, which can put pressure on their operating capital (Ting, 1995).

Medicare makes a distinction between routine services and ancillary services. Ancillary services include services for which charges are customarily made in addition to routine services (HCFA, 1995). Examples of ancillary services include speech therapy, occupational therapy, and physical therapy. As intensive rehabilitation services and other reimbursement for such services will increase their importance. Medicare reimbursement for therapies and other ancillary services provided in SNFs may be reimbursed in one of two ways (HCFA, 1995). If the services are provided by the SNF and are billed to

Figure 5. Skilled Nursing Facility Exemption Requests
1989-1994



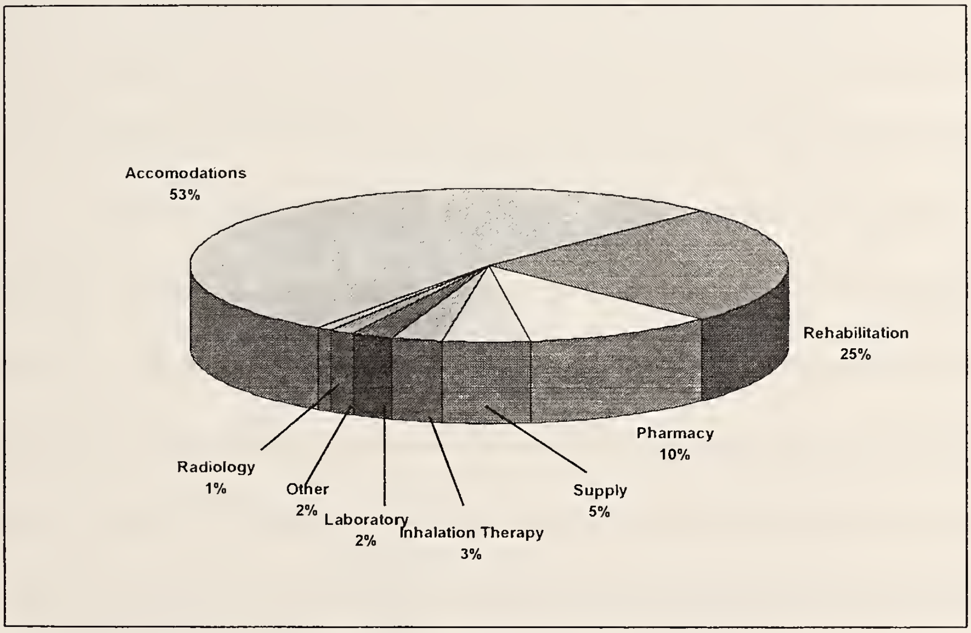
Source: HCFA Bureau of Policy Development

Medicare by the SNF, the SNF is reimbursed for "reasonable costs" of these services, under Part A. If the services are provided under contract and are billed directly to Medicare by the provider, the provider is reimbursed under Part B (DHHS, 1995). Subacute care providers must decide whether to provide ancillary services directly or to contract for them with outside suppliers, and how they will bill.

Ancillary service costs are apportioned to Medicare on the basis of the ratio of Medicare beneficiary charges to all patient charges (HCFA, 1995). A ratio is calculated for each ancillary department and applied to the total cost of that department to establish Medicare's share of its overall costs (HCFA, 1995). Between 1988 and 1993, the total ancillary charges for Medicare SNF admissions climbed from $772 million to $4.9 billion (DHHS, 1993). Sixty percent of nursing home residents (SNFs and NFs) received at least

some therapy services, and the average ancillary charges for a Medicare SNF admission exceeded $3,800 in 1993 (HCFA, 1993). Ancillary charges were 47 percent of total SNF charges in 1992 (Figure 6).

Figure 6. Percentage Distribution of Medicare Skilled Nursing Facility Service Utilizations, 1992



Source: HCFA Bureau of Data Management and Strategy

Medicare policies on coverage and payment for respiratory services have an adverse effect on home health care providers and freestanding SNFs as compared to other providers of subacute care. Respiratory services from home health care providers are not covered. For freestanding SNFs, Medicare requires that respiratory therapists be hospital employees in order to be reimbursed as ancillary rather than routine costs (DHHS, 1995).

Freestanding SNFs with small ventilator programs, for example, may either contract with a hospital for respiratory therapy services or include the costs of these services within their routine cost limits. The literature shows that the reimbursement under Routine Cost Limits usually is less than the cost basis, so that the SNFs exceed their cost limits (DHHS, 1995; Griffin, 1995).

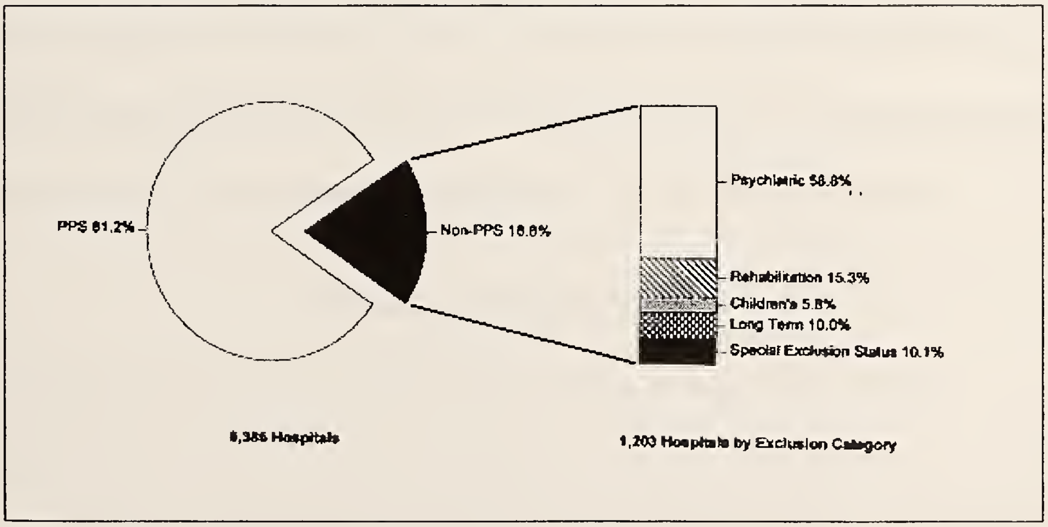
Capital cost reimbursement also is available, and is separate from the reimbursement for routine costs and ancillary services. Because Medicare allows SNFs to allocate a portion of their overhead costs to Medicare patients, SNFs have an incentive to maximize those costs associated with the allocation method (DHHS, 1995). For instance, in order to maximize their allocation of overhead to Medicare, they may maximize the amount of space allocated to ancillary departments such as the physical therapy room, and also upgrade nursing staff to meet the needs of higher acuity residents (Griffin, 1995). Increasing the square footage of ancillary departments will increase the allocation of capital to Medicare, and higher nursing costs will increase the allocation to Medicare of general and administrative, housekeeping, and social service overhead costs (DHHS, 1995).

## Specialty Hospitals and Distinct Part Units

The federal government exempts several types of hospitals from PPS, including rehabilitation hospitals and units, long-term hospitals, psychiatric hospitals, children's hospitals, and other specialty hospitals and units (Schnieder, Cromsell, and McGuire, 1993). These facilities were excluded from PPS primarily because the DRG system used for general acute care hospitals does not adequately predict their resource costs.

Medicare reimburses most PPS-exempt hospitals on a facility-specific, cost-related basis (per discharge), under rules established in the Tax Equity and Fiscal Responsibility Act (TEFRA) of 1982. A total of 1,203 specialty and special-status hospitals - 18.8 percent of all Medicare participating hospitals - were exempt from PPS during 1993 (HCFA, 1995). The detailed exclusion category is presented in Figure 7. Another 1,832 distinct-part units (psychiatric and rehabilitation) of participating specialty and special-status hospitals were excluded from coverage under PPS in 1993 (HCFA, 1995).

Figure 7. Medicare-Participating Hospitals, by Prospective Payment System (PPS) Status and Exclusion Category
CY 1993



Source: Health Care Financing Administration, Bureau of Data Management and Strategy: data from the Medicare Decision Support System; data development by the Office of Research and Demonstrations.

Under TEFRA, these hospitals are either paid on the basis of their Medicare allowable operating costs (including nursing, therapies, and so forth) per discharge, or are paid a target amount. The target amount is based on the provider's allowable costs per case in a base year. The Secretary of Health and Human Services is required by OBRA 1990 to provide a target amount exception to hospitals and distinct part units that can show that "events beyond the hospital's control, or extraordinary circumstances, including changes in case mix and volume" have changed their cost structure significantly (Schneider, Cromsell, and McGuire, 1993). For example, if the hospitals' costs per discharge fall below the target amount, the hospital is reimbursed the lesser of; 50 percent of the difference between its costs and the target or 5 percent of the target (DHHS, 1995; Schneider, Cromsell, and McGuire, 1993). On the other hand, if the hospital's costs are above the target rate, it is reimbursed the target rate plus 50 percent of the difference between the target rate and its costs (DHHS, 1995). The additional amount may not, however, exceed 10 percent of the provider's target rate (Griffin, 1995).

## Managed Care Reimbursement

Managed care is any care arrangement in which a provider agrees to sell specifically defined services to one or more payers, subject to a strong system of utilization review. Since subacute services cost less than acute care services, they have become a principal interest of managed care organizations (MCOs) today. For example, California subacute SNFs are dominated by managed care, as 40 to 82 percent of their payer mix consists of managed care (CAHF, 1994; DHHS, 1995).

The incentives to use subacute care providers depend on the particular organizational and financial arrangements of the managed care organization (MCO). A managed care plan that operates its own acute care facilities may have an incentive to keep patients in the acute care setting unless the marginal cost of an additional hospital day exceeds the per diem charge of a subacute care provider (DHHS, 1995). In contrast, managed care plans that do not own and/or operate their own facilities, but pay providers a negotiated per diem rate have an incentive to discharge the patient as soon as possible from the hospital into a setting where the negotiated per diem is lower (DHHS, 1995).

Reimbursements for subacute care services under a managed care contract will be any of the following five payment arrangements: discounted charges, percentage of premium, per diem rate, per case, or capitation (Cook, 1993). Discounted charges means that the provider agrees to provide medical services at a discount from its standard charges for such services (Griffin, 1995). The risk to the SNFs is in the price: as long as the discounted price equals or exceeds the facility's costs, the contract may be good for the SNF. Under percentage of premium, a provider agrees to accept a certain percentage of the managed care payer's monthly premiums in return for providing all covered medical services to the enrollees during that month (Cook, 1993).

In payment at a per diem rate, the managed care payer pays the provider a fixed rate for each day an enrollee is treated in the provider's facilities (Cook, 1993). A per diem contract will include a package or bundle of services. For example, in a nursing facility, the package typically includes room and broad, traditional nursing care, medical supplies, dietary, housekeeping, laundry, and ancillary services. A maximum level of service, such as hours of therapy, may be specified, and certain costly services may be

excluded from the per diem contract and charged separately at a mutually agreed-upon price (Lubarsky, 1996).

Under a per case method, the payer pays the provider a fixed rate for each case of inpatient treatment. The per case method is similar to the DRG reimbursement system for hospitals under Medicare. A specific dollar amount is paid for a particular type of case or diagnosis (Lubarsky, 1996). Examples of how this system works are cases involving stroke or orthopedic rehabilitation, where length of stay and clinical protocols are well defined. In these situations, the MCO negotiates one price for the entire patient stay (Griffin, 1995). The subacute care provider will have the risk of financial loss if its costs exceed the per diem reimbursement or per case payment.

Under a capitation arrangement, the provider receives from the managed care payer a fixed payment per enrollee per month (Griffin, 1995). For the monthly fee, the SNF provider agrees to provide specified medical services to the payer's enrollees (Smith, 1996). The number of enrollees cared for, rather than the utilization of services, controls the providers' revenues. In other words, the provider receives the fixed payment per month regardless of the amount or costs of the services provided to enrollees. In Lewin-VHI studies, the authors have found that capitated payments are more likely to be used in subacute facilities, to contain costs (DHHS, 1995).

There are some difficulties in implementing capitation arrangements for reimbursement. For example, most MCOs contracts require the subacute care provider to collect the copayment amount from the patients. Thus, the SNF may take a risk on unlikely collection (Stahl, 1995). Another example is ancillary services, such as physical therapy, occupational therapy, speech therapy, and infusion services. If the subacute care

provider hires subcontracted vendors to deliver ancillary services, it may find that competitive pricing does not exist in a capitated environment (Stahl, 1995). Thus, subacute care providers should either hire their own therapists rather than subcontracting, or establish their own "capitation agreement" with the subcontracted vendors to control expenditures (Cook, 1993).

To summarize this section: reimbursement has a major impact on subacute care. Medicare reimbursement for subacute care includes routine costs, ancillary costs, and capital costs. Routine costs are generated from routine services such as regular room, dietary, nursing services, and so on. Medicare offers a three-year exemption from Routine Cost Limits for new hospital-based providers; that is, for the first three years they will receive cost-based reimbursement. Costs also are reimbursed for ancillary services, including physical, occupational, and speech therapies. There are two ways to reimburse the ancillary services. If ancillary services are provided and billed by the SNF, the SNF is reimbursed for the "reasonable costs" of these services under Part A. On the other hand, Part B is applied if the ancillary services are offered under a contracting arrangement and billed by the provider. Capital cost reimbursement is separate from the reimbursement for routine costs and ancillary costs. SNFs with Medicare patients can allocate a portion of their overhead costs to Medicare.

Several specialty hospitals and distinct-part units are exempt from PPS; they include rehabilitation hospitals and units, long-term hospitals, psychiatric hospitals, children's hospitals, and other specialty hospitals and units. Rather, these hospitals are paid either on the basis of their Medicare allowable operating costs per discharge, or a target amount.

Managed care organizations (MCOs) will become another major payer for subacute care services. MCOs may refer their enrollees to hospital-based or freestanding nursing homes, depending on different payment arrangements. Reimbursements for subacute care services under a managed care contract will be in any one of the following five payment policies: discounted charges, percentage of premium, per diem rate, per case, or capitation. Studies have found that subacute care facilities are more likely to use capitated payments, to contain costs.

## The Destination After Acute Care

Acute care hospitals have a mixed relationship with subacute providers. On the one hand, to maximize Medicare margins under PPS, hospitals seek relationships with SNFs willing to accept transfer of their patients requiring high acuity care. On the other hand, in order to maximize other revenues and keep their occupancy rates up, hospitals may compete with subacute SNFs for managed care patients. The best financial strategy for some hospitals is to discharge Medicare patients to their own hospital-based SNFs (CAHF, 1994), but acquiring SNF beds is often restricted by CON regulations. (Please refer to the section on Regulation of Nursing Homes for the details). In Lewin-VHI's studies, researchers have found that one hospital association in Los Angles reported that 100 percent of hospitals have an arrangement with a subacute facility: 40 percent have their own SNFs and the other 60 percent have relationships with freestanding SNFs (DHHS, 1995).

Subacute care can be provided by a number of types of institutional providers: freestanding skilled nursing facilities, hospital-based skilled nursing facilities.

rehabilitation hospitals, distinct-part rehabilitation units, and long-term hospitals. Appendix A presents the differences among these types. HCFA defines a SNF as hospital-based if it meets the following conditions: 1) The SNF and the hospital have a common governing board. 2) The two are financially integrated by using a common cost report and requiring step-down allocation methodologies. 3) The distance between the two facilities (if they are not co-located) should be reasonable, as demonstrated by the existence of the above conditions as well as fully shared services (Deangels, 1987). Table 4 shows the differences between hospital-based and freestanding SNFs, in six major areas.

Table 4.
Major Characteristics of Hospital-Based versus Freestanding SNFs

| Characteristic | Freestanding SNFs[a] | Hospital-Based SNFs |
|---|---|---|
| Level of Care | Chronic/Supportive | Restorative/Rehabilitative |
| Percent of Medicare Patients | Very small percent (if certified for Medicare) | Very high percent |
| Nursing Hours | 2.5 - 3.0 | 4.0 - 4.5 |
| Length of Stay | one to two years | 15 to 30 days |
| Medicare Reimbursement | $50 - $60 | $95 to $105 |
| Facility Size | 60+ | 15 to 30 beds |

[a] These figures all represent community nursing homes. It is known that Medicare distinct units within community facilities will have higher averages, but still less than for hospital-based SNF units.

Source: Healthcare Financial Management, August, 1987.

Several factors determine the destination of subacute care patients. The first is insurance coverage. For example, managed care groups are more likely that other payers to play a role in the decision about a patient's discharge destination (Anders, 1994; DHHS, 1995). MCOs are increasingly developing contractual relationships with

subacute providers, which then are a major factor in deciding where the patient is discharged (DHHS, 1995; Hegland, 1994; Parker, 1994). MCOs believe that the freestanding SNFs can adequately treat the subacute patients; and they prefer discharging a patient to a less expensive, freestanding SNF. For the Medicare fee-for-service patient there tends to be more flexibility, since there are no relationships or contracts for specific subacute providers.

A second major factor influencing destination is physician preference. If physicians are not familiar with the subacute facilities, they are hesitant to transfer patients to what they consider to be nursing homes. Lewin-VHI studies found that most physicians prefer discharging a patient to a hospital-based unit, where the physician can monitor the patient's progress more closely and have more control over the staffing level (DHHS, 1995). The inconvenience of long travel times to SNFs discourages physicians from following patients to SNFs after discharge, particularly if a physician's patients are scattered across more than one SNF. Medicare payment policies for physician visits to SNFs could be disincentive to physicians' using subacute care. A comparison of physician reimbursement rates under Medicare for hospital and for SNF care shows that reimbursement for a SNF visit may be slightly less than that for a hospital visit. For example, rates provided by a Florida carrier indicate that the range of Medicare physician reimbursement for admitting a patient to a hospital is $73 to $138 (DHHS, 1995). Physician reimbursement for the comparable service in a SNF, a comprehensive assessment, is $59 to $122 (DHHS, 1995).

Hospital discharge planners think that a hospital-based SNF is better than a freestanding SNF because easily accessibility in doctors and emergency services

(Deangelis, 1987; Knapp, 1995). Other factors to be considered when deciding the destination of subacute care patients include patient acuity, the informal support system, patient preference, the facility's quality, and costs (Levenson, 1996).

Nearly two thousand acute hospitals are believed to have skilled nursing units (Griffin, 1995). About 25% of current subacute capacity is in the hospital setting, including hospital-based SNFs (Ting, 1995). Most of these skilled nursing units within acute hospitals are transitional subacute units and are licensed under the laws of their states as skilled nursing facilities. The hospital-based subacute SNFs provide a way to reduce the average acute care length of stay of Medicare beneficiaries and other fixed payment patients, such as those enrolled in MCOs. The hospital-based subacute SNFs know the extent of the demand for their services within their own institutions, if they can manage the connection between acute care and subacute care (Griffin, 1995). The freestanding SNFs lack that advantage. In other words, the hospital-based subacute SNFs can control their own demand and supply under a certain and stable condition.

Another advantage of placing subacute care patients in the hospital-based subacute SNFs is that hospitals have long-standing close relationships with physicians, who are essential to subacute care. Hospital-based subacute SNFs can share the hospital's current equipment without building a new facility such as in-wall oxygen or suction, or the physical dimensions suitable for providing care (Griffin, 1995). From the cost perspective, improving the equipment will cost more for a freestanding nursing home than for a hospital-based subacute SNF. For example, for a nursing home to establish a subacute care unit might cost a minimum of $250,000 (Ting, 1995). The cost includes program design, staffing training and hiring, remodeling, equipment purchased, and so

forth. One nursing home provider has estimated that the facility spends over $10,000 per bed to upgrade them for ventilator support, plus the maintenance expenses for routine monthly and annual testing of the generator and/or medical gas distribution systems (Sloane, 1995).

Although hospital-based SNFs have several advantages in caring for more subacute care patients, freestanding SNFs nevertheless could develop and delineate a scope of subacute services within their limited resources. For example, freestanding SNFs might focus on wound care, intravenous care, or assisted living, to reduce the cost of new construction.

To summarize this section: The destinations after acute care can be any of the following different institutions: freestanding skilled nursing facilities, hospital-based skilled nursing facilities, rehabilitation hospitals, distinct-part rehabilitation units, and long-term hospitals. The factors determining the destination for subacute care include type of insurance coverage, physician preference, the views of the acute care hospital's discharge planners, the informal support system, patient acuity, patient preference, the quality of the facility, and facility costs. The literature shows that most of the acute care sectors have their own arrangements for the subacute care patients, including both hospital-based and freestanding SNFs. Several studies have found that the hospital-based SNFs are the preferred destination after discharge from acute care.

## Regulations for Nursing Homes

### Certificate of Need (CON)

Most states continue to constrain supply by requiring CONs before any new nursing home beds are built. Moreover, in the last few years at least 12 states have placed moratoria on construction of new nursing home capacity (Swan, Harrington, and Grant, 1988). These policies, in the face of the increased demand from an aging population and the pressures from a prospective payment system that encourages hospitals to discharge more patients to nursing homes, suggest a disregard of the effect that excess demand might have in lowering quality (Davis and Freeman, 1994; Nyman, 1989).

Although CON regulation has been eliminated in some states and may become obsolete under a revised from of managed competition, a CON is now required in many states before the construction and development of a new subacute facility or the implementation of a new subacute program (Griffin, 1995). The CON review process can bar the entry of providers attempting to develop new subacute care facilities or programs. Restrictive CON regulations have been criticized as based on a state's need contain its Medicaid budget, rather than on considerations of medical care (Kenney and Holahan, 1991; Nyman, 1989; U.S. General Accounting Office, 1990). In particular, this criticism often is aimed at CON regulations that inhibit the development of new nursing facility beds or place a moratorium on new beds. For instance, research studies have found that states with restrictive CON policies tend to have an under supply of nursing facility beds and a correspondingly high occupancy rate for nursing facilities (DHHS, 1995; Nyman,

1989). As a result, the demand for nursing facility care in those states exceeds the supply of available beds. The studies found that in such a situation, nursing facilities have more incentive to choose only the most profitable applicants, such as higher-paying private payers or applicants who need relatively limited care. Applicants who need more care, such as subacute patients, may have trouble getting admitted to a nursing facility (Nyman, 1989). The studies concluded that restrictive CON requirements for nursing facility beds are an underlying causal factor for many of the delays and access problems that hospitals meet as they try to discharge subacute and high acuity patients into post-acute settings (DHHS, 1995; Nyman, 1989).

CON requirements have a direct impact on the development of subacute care. For example, in Los Angeles, the lack of CON requirements has encouraged the development of subacute care (DHHS, 1995): the number of hospital-based SNFs has increased, while the number of freestanding SNF beds has remained relatively constant. This is said to reflect the high cost of land in Los Angeles and also the fact that to develop a new freestanding SNF requires a much greater investment than does converting unused hospital beds to a SNF unit. It also implies that there are enormous excess bed capacity. However, California is reviewing its CON policies, and new regulations may affect any further development of subacute care. Some other states, such as Massachusetts and Ohio, that have CON requirements provide less subacute care in SNFs (DHHS, 1995).

On the other hand, many states have CON exemptions for the following procedures or arrangements: the development of skilled nursing facilities (SNF) beds or swing beds in a rural area, the conversion of a hospital's acute care beds to SNF beds, the conversion of acute care hospital beds to long-term-care hospital beds, the addition of a

limited number of new beds to an existing facility, and the conversion of an entire facility from a hospital to a SNF (Griffin, 1995). For example, under Florida is CON requirements for hospitals that had been in effect since the early 1970s, hospitals have several options for converting acute beds to SNF beds. Hospitals can buy an existing SNF, obtain a CON for a SNF, or obtain a CON to convert acute beds. However, hospitals cannot lease beds from a SNF. These regulations were perceived to contain a regulatory loophole, because hospitals had a means by which to convert beds without CON review. In 1994, Florida regulations were modified to require a CON for the conversion of a general acute hospital to a long-term-care hospital. Currently, there is a bill under consideration in Florida to allow a one-time conversion of acute beds to SNF beds (DHHS, 1995).

## Medicare Certification and OBRA

### Freestanding Skilled Nursing Facilities

Freestanding subacute SNFs are subject to the same Medicare regulations and requirements of participation as all other SNFs are under Medicare (and nursing facilities are under Medicaid). The subacute SNF is subject to the survey, certification, and enforcement procedures and the requirements of participation developed under the Omnibus Budget Reconciliation Act (OBRA, 1987). OBRA defined quality in long-term care in terms of resident outcomes and resident rights, and it recognized that without providers' appropriate attitudes and motivation, the quality of care is inadequate (Wunderlich, Sloan, and Davis, 1996).

OBRA 87 required nursing facilities to have licensed nurses on duty 24 hours a day; a RN on duty at least 8 hours a day, 7 days a week; and a RN director of nursing (OBRA, 1987). The statute permits the director of nursing and the RN on staff for 8 hours to be the same individual. However, because of a nurse shortage at that time, Section 1919(b(4)(C)(ii)) of the Social Security Act authorizes any state to waive the requirements for 24-hour licensed nursing service as well as the 8-hour-a-day RN presence if certain criteria are met (Wunderlich, Sloan, and Davis, 1996).

The OBRA 1987 requirements of participation represent dramatic changes to the previous conditions of participation for SNFs and nursing facilities. The new requirements of participation emphasize treatment outcomes rather than treatment process, as was the case under the previous conditions of participation (OBRA, 1987). The requirements of participation are extensive and impose standards covering virtually every aspect of a nursing facility's operations (Costa, 1989; Griffin, 1995). Several studies have shown some degree of improvement in nursing homes since OBRA 87 was implemented. The average number of deficiencies declined from 8.8 percent per facility in 1991 to 7.9 percent in 1993 (Harrington et al., 1995). Marek et al. suggest that the quality of care has improved and that restraint use has decreased (Marek et al., 1996).

SNFs face challenges in coordinating OBRA and other statutory requirements with their subacute care programs. For instance, federal requirements require subacute care providers to provide discharge notices 30 days in advance. However, since the average length of stay (ALOS) for many subacute patients is less than 25 days (Burns, 1993; DHHS, 1995; Griffin, 1995), the requirements can give the families the wrong message and also discourage providers from serving many of such patients. Subacute

care providers also express concern about the content of Minimum Data Set (MDS), the federally-required resident assessment and care planning system developed for nursing homes. Minimum data set may not adequately capture important characteristics of the higher acuity from subacute patients, a factor that would become particularly important if the MDS is used as the basis for a Medicare case-mix payment system for SNFs (Brent, 1990).

## Hospital-Based SNFs

The development of a hospital-based SNF requires compliance with three Medicare regulatory areas: the hospital-based status criterion, Medicare requirements of participation and other OBRA 1987 requirements, and Medicare distinct part requirements.

HCFA defines a hospital-based SNF according to reimbursement category, not geographic location. A SNF is determined to be hospital-based when it is an integral and subordinate part of hospital and is operated with the other departments of the hospital under common licensure, governance and professional supervision (Deangelis, 1987). In other words, a hospital attempting to obtain hospital-based status from the HCFA for a nursing facility must show that there will be common governance between the hospital and the SNF, integrated services between the hospital and SNF, and a common cost report filed each year by the hospital and the SNF (DHHS, 1995; Griffin, 1995).

In terms of the Medicare requirements of participation and the other OBRA 1987 requirements, the hospital-based facility must comply with all the OBRA 1987 requirements that are applicable to freestanding SNFs. Hospitals may find it difficult to

function within the highly regulated nursing facility industry (Costa, 1989; Griffin, 1995; Morford, 1988).

Hospital-based SNFs are also subject to Medicare distinct part requirements if they are developed as parts of the hospital facilities. Many hospital-based facilities are developed by converting acute care hospital beds and space to SNF beds and space, and such units must satisfy distinct-part guidelines (Deangelis, 1987). The unit must be physically separate from the rest of the institution and be an entire, physically identified unit comprising of all beds within the unit (DHHS, 1995). Examples include a separate building, floor, wing, or ward (HCFA, 1989). The unit does not necessarily, however, be confined to a single location within the hospital's physical plant (Griffin, 1995).

To summarize this section: Some states have CON exemptions for several arrangements, such as the development of SNF beds or swing beds in a rural area, the conversion of a hospital's acute care beds to SNF beds, the conversion of acute care hospital beds, the addition of a limited number of new beds to an existing facility, and the conversion of an entire facility from a hospital to a SNF. However, many states require a CON before the construction and development of a new subacute facility or the implementation of a new subacute program. Several studies show that CON requirements prevent the addition of nursing facility beds and are a factor in many of the placement delays and access problems hospitals meet as they try to discharge their subacute and high acuity patients into post-acute settings. Some states have placed moratoria on new nursing home bed construction. These policies intensify the issue of excess demand in the nursing home industry.

Other important regulations on subacute care are Medicare regulations and OBRA 1987. A freestanding subacute SNF is subject to the same Medicare regulations and requirement of participation as all other SNFs under Medicare, and also to the requirements under the OBRA. A hospital-based SNF is required to comply with three types of Medicare regulation: the hospital-based status criterion, Medicare requirements of participation and other OBRA 1987 requirements, and Medicare distinct-part requirements.

## Summary

Based on this review, the PPS did affect hospital length of stay and Medicare discharges. It also increased the pressure for subacute care services in SNFs. All of the different reimbursement mechanisms, including Medicare, Medicaid, managed care, and other private insurance plans could directly or indirectly impact the growth of subacute care services. Not only reimbursement systems, but also the aging population and also new technology foster the demand for subacute services. The literature shows that CON and moratoria had a direct negative effects on the development of subacute care facilities. These environmental factors influence subacute care services.

As the review of literature has demonstrated, subacute care services in SNFs are still diversified. It is apparent that both the definition and the scope of subacute care services are too indefinite for it to be feasible to set an appropriate standard that will ensure high quality care. There is no evidence that SNFs have continually increased subacute services since PPS. It is difficult to understand the adaptive behaviors of

subacute care providers while the case mix is changing in the nursing home industry. There has been little research on subacute care services that compares the hospital-based SNFs and freestanding SNFs.

This research examines how the skilled nursing facilities respond to the increasing demand for subacute services. It also inquires whether subacute services are constantly being added by the nursing home industry. The hospital-based and freestanding SNFs are compared for their capabilities to deal with subacute care patients. Finally, the causal relationship between environmental factors and subacute care services is confirmed.

# CHAPTER 3
# THEORETICAL FRAMEWORK

## Resource Dependence Theory

Organizational researchers have recognized the importance of the environment to organizations. The environment is multi-dimensional and has many differentiated effects on a number of organizational characteristics. Resource dependence theory conceptualizes the environment in terms of the other organizations with which the focal organization engages in exchange relationships (Pfeffer and Salancik, 1978; Thompson, 1967). Organizations strive to maintain their autonomy and identity, reduce uncertainty, and prevent unnecessary dependence on their environments (Cook et al., 1983). The perspective refers to the efforts that organizations make to adapt to changing environmental circumstances (Cook et al., 1983; Lawrence and Lorsch, 1967; Pfeffer and Salancik, 1978; Thompson, 1967) and emphasizes the limits or constraints imposed by the environment on an organization's abilities to adapt (Cook et al., 1983; Pfeffer and Salancik, 1978).

Organizations cannot generate internally all the necessary resources to accomplish their tasks; they have to interact with the environment to obtain the resources by which to survive. For SNFs, these resources include subacute care patients, staffing, capital, favorable regulation, etc. Because organizations do not control all the resources they need, resource acquisition may be a problem, particularly if resources are scarce or the sources of supply are unreliable (Pfeffer and Salancik, 1978). Entering into exchange relationships with other organizations is one way to secure the needed resources, but the

focal organization may thereby lose some power or control to the other organizations. Another way to maintain an organization's autonomy is to change internal strategies to ensure resource stability.

This perspective is strongly rooted in an open system framework, which suggests that one cannot understand the structure or behavior of an organization without understanding the context in which it operates (Scott, 1990). No organization is self-sufficient; instead, all organizations must engage in exchanges with the environment to survive. The need to acquire resources creates dependencies between organizations and external units. How important and how scarce these resources are determines the nature and the extent of the organizational dependency (Pfeffer and Salancik, 1978; Scott, 1990).

The resource dependence perspective also views organizations as active in determining their own fate. Organizational participants, particularly managers, scan the relevant environment, searching for opportunities and threats, and attempting to strike favorable bargains and to avoid costly entanglements (Scott, 1990). Acquiring the external resources needed for the organization is done by reducing the organization's dependence on others and/or increasing others' dependence on it - in short, by modifying an organization's power relations with other organizations.

The resource dependence perspective rests on a number of assumptions that explain how organizations work to acquire power (Pfeffer and Salancik, 1978). First, organizations are assumed to comprise both internal and external coalitions (Pfeffer and Salancik, 1978), altering their structure and their patterns of behavior to acquire and maintain needed external resources. Coalitions emerge from the social exchanges that are

formed to influence and control behavior (Ulrich and Barney, 1984). Second, the environment is assumed to contain scarce and valued resources essential to organizational survival (Cook et al., 1983; Pfeffer, 1978). In that respect, the environment poses a problem of uncertainty in resource acquisition for organizations. Uncertainty in organizational terms refers to the degree to which future states of the world cannot be anticipated or accurately predicted (Pfeffer and Salancik, 1978). Uncertainty is a problem for organizations only when the uncertainty involves important interactions with other environmental elements that are important for the organization (Pfeffer and Salancik, 1978). Third, organizations are assumed to work towards two related objectives within their environment: (1) to acquire control over resources that can minimize their dependence on other organizations and (2) to acquire control over resources that can maximize the dependence of other organizations on them (Ulrich and Barney, 1984). Attaining either objective can affect the exchange between organizations by increasing an organization`s power (Pfeffer and Salancik, 1978).

The resource dependence perspective can be enhanced by Williamson's notion of transaction costs (Williamson, 1975, 1976, 1982). Williamson develops a transaction cost approach to the choice by organizations of whether to integrate vertically or to contract for services and products. Williamson suggests that when transactions occur frequently and when the resources involved are specific to the transaction, vertical integration is the most efficient organizational solution, because it minimizes transaction costs. That economy permits the organization to develop an internal mechanism for sequential adaptation to rapidly changing environments, without the transaction costs of continually renegotiating contracts. In contrast, when exchanges are only occasional and

when the resources involved are not specific to them, contracts between organizations minimize production and transaction costs. Williamson (1982) suggests that the decision to shift transactions from firms to markets is partly determined by the level of environmental uncertainty. The greater the uncertainty, the greater the pressure to internalize such transactions to provide the capacity to adjust to changing circumstances. Excess demand on the nursing home industry coupled with the greater medical acuity of patients can be a source of uncertainty, which  will impose a number of transaction cost decisions. The transaction cost framework looks at the interorganizational adaptation responses, as opposed to other, intraorganizational responses (Cook et al., 1983).

The organizations in this study, skilled nursing facilities, are viewed as capable of adapting to environmental forces by modifying internal structural arrangements as well as by establishing various types of interorganizational arrangements. This study assumed that environmental forces including excess demand for nursing home care, change in their patients' severity of illness, regulations, and characteristics of the reimbursement system. Changes in organizational structure, strategy, and process leave an organization “stronger” or “weaker” in terms of adaptive capability to deal with subsequent external forces or changes in the environment (Cook et al., 1983).

## Conceptual Framework for the Study

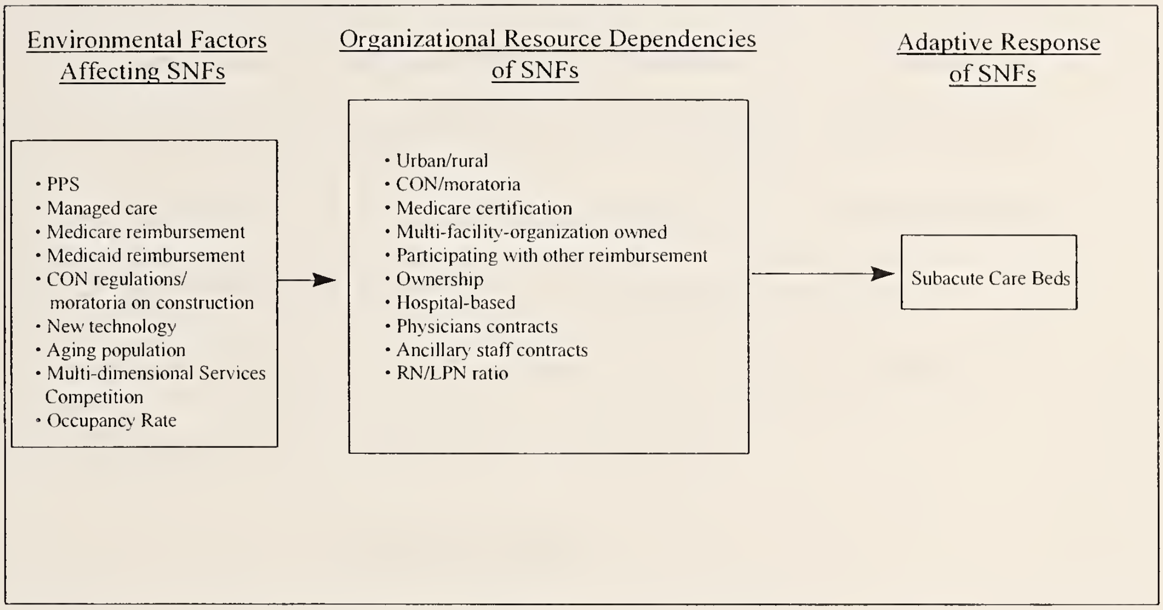
The conceptual framework for this study derives from the literature on resource dependence. The organizations studied are individual SNFs. Several environmental forces affect the subacute care industry. The implementation of PPS has changed the incentives from hospital reimbursement, leading hospitals to shift sicker patients to

nursing homes, and thus increase uncertainty for the SNFs. Second, the growth of managed care organizations is another environmental factor influencing SNFs. As managed care enrollment grows, the competitive pressures to seek less costly alternatives to hospital acute care increase.

Third, Medicare and Medicaid policies also affect the subacute care environment. Medicare payment policies for post-acute care encourage new entrants and expansions in the subacute care industry. In contrast, the low reimbursement rates of Medicaid motivate nursing homes to seek other resources for stabilizing their financial status. Fourth, CON regulations are an environmental constraint inhibiting the development of new SNFs or placing a moratorium on adding new beds. Fifth, multi-dimensional services - physical, occupational, and speech therapies, as well as laboratory, radiology, and pharmacy services - have become common in nursing homes. The multi-dimensional competitive environment facilitates the dependence relationship between nursing homes and other organizations. Finally, the increasingly aging population and innovations in technology have increased the demand for long-term care services.

This study makes the assumption that the environmental factors outlined above change the allocation of resources and the dependence relationships of SNFs. These factors either expedite or constrain SNFs' adaptation to the increasing demand for subacute care. Figure 8 displays the proposed conceptual framework for this study. The following section develops hypotheses about SNFs' adaptive changes.

Figure 8. The Conceptual Framework for The Study


Environmental Factors Affecting SNFs
Organizational Resource Dependencies of SNFs
Adaptive Response of SNFs
• PPS
• Managed care
• Medicare reimbursement
• Medicaid reimbursement
• CON regulations/ moratoria on construction
• New technology
• Aging population
• Multi-dimensional Services Competition
• Occupancy Rate
• Urban/rural
• CON/moratoria
• Medicare certification
• Multi-facility-organization owned
• Participating with other reimbursement
• Ownership
• Hospital-based
• Physicians contracts
• Ancillary staff contracts
• RN/LPN ratio
Subacute Care Beds

## Hypotheses

Resource dependence theory portrays organizations as open systems interacting with the environment in order to acquire necessary resources. Organizations are not self-directed and autonomous; instead, they are somewhat dependent on their environments. The dependence relationships may change according to the availability, demand, scarcity, importance, and concentration of resources. The following hypotheses are derived from a review of the relevant literature and from the resource dependence theory. The hypotheses test the relationship between organizational resource dependencies and subacute care services.

### Metropolitan Areas

According to resource dependence theory, all organizations strive to maintain their autonomy and identity, to reduce uncertainty, and to avoid unnecessary dependence on their environments (Cook et al., 1983). Environments vary with respect to munificence (the abundance of resources) and uncertainty (the variability and complexity involved in acquiring resources) (Banaszak-Holl, Zinn, and Mor, 1996). The decision whether or not to comply with the needs or demands of other organizations depends on how abundant and stable resources are in the environment, in this case of the subacute care industry.

The degree of competition in the local market is one environmental factor influencing compliance with external constituencies (Banaszak-Holl, Zinn, and Mor, 1996). SNFs in metropolitan areas are likely to face more competition; in a more

competitive environment, organizations share a limited resource pool (Pfeffer and Salancik, 1978), and their survival depends more upon how resources are allocated among the competitors. Metropolitan populations have been shown to use more services per capita than rural populations do, which would increase the demand for services in states with more metropolitan areas (Harrington, Swan, Nyman, Carrillo, 1997). In addition, since hospitals located in metropolitan areas are more likely to manage their subacute discharges within their own networks and affiliations, it is unlikely that many of their patients would be transferred back to the local market for subacute care (Gill, 1996).

> H1: SNFs in metropolitan areas have a higher percentage of subacute care beds than SNFs in non-metropolitan areas.

## Certificate of Need

State regulatory policies also have a major effect on the ability of an organization to secure resources from the environment (Cook et al., 1983), in part by discouraging innovative changes among competitors (DiMaggio and Powell, 1983; Meyer and Rowan, 1977). Regulation has limited nursing homes revenues and costs, has forced facilities to alter their outputs, and has brought about changes in organizational structure (Alexander and Morrisey, 1989). While changing in stringency and scope, most state policies aimed at controlling Medicaid costs have focused primarily on containing the supply of nursing facility beds (Banaszak-Holl, Zinn, and Mor, 1996). Restrictions on construction for new beds under CON and new construction moratoria have limited the growth of additional SNF capacity in many states. Harrington, Swan, Nyman, and Carrillo suggested that states with a certificate of need requirement and/or moratorium did have significantly less growth in nursing home beds (Harrington, Swan, Nyman, and Carrillo, 1997). Nursing

home facilities and hospitals constrained from making capital expenditures may be less able to add more subacute care beds than they would be without such constraints.

> H2: SNFs in states with active CON programs or moratoria on new construction have a higher percentage of subacute care beds than others.

### Chain Affiliated

An affiliated facility is defined as a facility owned by an organization that owns (or leases) two or more nursing facilities. Affiliations between nursing homes and other providers benefit all the providers (Zinn and Mor, 1994). For example, high-quality, market-sensitive programs for subacute care can best meet the heterogeneous needs of subacute patients by melding each provider's respective skills to develop a seamless continuum of care. Several advantages exist in the multi-facility organizations. First, multi-facility organizations are organized systems, so they can attract managed care contracts and improve revenue streams for the skilled nursing facility. Second, multi-facility organizations can create a market-sensitive program that moves patients to the most effective and efficient level of care in a smooth and timely way (Zinn and Mor, 1994). Consequently, the affiliated facilities can ensure obtaining the critical resource, patients, in the market.

Weissert and Cready found that the patients discharged to a facility closely affiliated with one of the study hospitals had about two and one-half fewer days of unnecessary stay than did those discharged elsewhere (Weissert and Cready, 1988). According to Zinn and Mor (1994), more of the chain-affiliated facilities than the independent facilities have special care units. Just under 10 percent of all non-profit chains have Alzheimer's care units. About 31 percent of for-profit, chain-affiliated

facilities provide head trauma and special rehabilitation care in dedicated units (Zinn and Mor, 1994). Chain-affiliated nursing homes have advantages over independent homes due to joint purchasing agreements, shared labor costs and centralized management (Davis, 1993).

From the resource dependence perspective, a SNF's decision to join a multi-facility arrangement depends on how available or stable the environmental resources are. Favorable conditions in the subacute care market (i.e., those that promote resource availability and stability for the SNF) allow a skilled nursing facility to remain self-sufficient and autonomous. On the other hand, resource scarcity or instability in the subacute care market compels a SNF to affiliate with a multi-facility organization, to ensure the acquisition of needed resources or to promote resource stability. Thus, this study hypothesizes that a SNF joining a multi-facility organization will allocate more beds to special care units than will an independent SNF.

> H3: Chain affiliated SNFs have a higher percentage of subacute care beds than independent SNFs.

## Reimbursement System

A key incentive to enter the subacute care industry is reimbursement. Because there is no separate Medicare or Medicaid reimbursement for subacute care, a facility providing such care seeks reimbursement under either the Medicare PPS reimbursement system for hospitals, the Medicaid reimbursement system for hospitals, the Medicare or Medicaid reimbursement system for PPS-excluded hospitals, the Medicare or Medicaid reimbursement for nursing facilities, or some form of managed care reimbursement

(DHHS, 1995). Freestanding SNFs face restrictive Medicare and Medicaid reimbursement systems that often do not cover the costs of treating subacute care. From a resource dependence perspective, that situation suggests that the skilled nursing facility cannot acquire the necessary resources from the environment to ensure its survival. Consequently, the higher operating costs for subacute programs may be a barrier to nursing homes entering that industry, in light of the low profit margins in traditional SNFs (Griffin, 1995).

The wide variation in Medicaid payment levels among states may reflect differences in their payment mechanisms as well as budget constraints (Swan. Harrington. and Grant, 1988). States have flexibility in establishing payment mechanisms for nursing facility care (Banaszak-Holl, Zinn. and Mor, 1996; Buchanan, Madel, and Persons, 1991). Some states use retrospective reimbursement; others set reimbursement in advance of the actual experienced costs, based on the facility's costs for the previous year.

Admission of subacute care patients are delayed because nursing home operators operate in a seller's market and can choose whom they admit. Often they choose not to admit Medicaid patients. The principle reason for denying admission to Medicaid patients is that Medicaid reimbursement is lower than the nursing homes' standard fees.

H4: SNFs that participate only in Medicaid have a lower percentage of subacute care beds than other SNFs.

## Ownership

The role of profit incentives in the provision of health services has drawn considerable speculation and research. Much of the research has been based on property rights theory, which stresses that the decision makers act to maximize utility, and assumes that in not-for-profit (NFP) organizations the incentive to maximize profits is attenuated (DeAlessi, 1980; Rosko, Chilingerian, Zinn, and Aaronson, 1995). NFP organizations serve multiple constituents and have more than the single goal of profit. Their goals may include better quality of care, community service, and employment of local citizens. NFP organizations are generally less consistent than for-profit organizations in minimizing their total costs and maximizing profits.

Maine's Medicaid nursing home research has found that for-profit (FP) ownership incurs lower costs in the categories of total variable costs, patient care costs, room and board costs, and administrative costs (Coburn, Fortinsky, McGuire, and McDonald, 1993). Many studies show that for-profit and non-profit facilities allocate their resources differently, with lower overall expenditures and lower staffing levels in for-profit nursing homes (Coburn, et al., 1993; Cohen and Dubay, 1990; Davis, 1993; Fottler, Smith, and James, 1985; Weisbrod, 1993). A study by Rosko et al. found that although NFP nursing homes may respond to environmental pressures by increasing their efficiency, the FP nursing homes tend to operate at a high level of efficiency irrespective of environmental and regulatory pressures (Rosko, Chilingerian, Zinn, and Aaronson, 1995). Two other studies show that for-profit status is associated with a lower likelihood of providing specialty care (Banaszak-Holl, Zinn, and Mor, 1996; Zinn and Mor, 1994).

From a resource dependence perspective, ownership is a way to possess a resource and therefore control it. Ownership is also a form of indirect discretion, in that it depends on a social-political concept and on enforceable social consensus (Pfeffer and Salancik, 1978). Since for-profit nursing homes seek low costs and high revenues, this study hypothesizes that for-profit organizations will hesitate to enter on or increase subacute care services.

H5: For-profit SNFs have a lower percentage of subacute care beds than not-for-profit SNFs.

## SNF Type

Subacute care patients can be discharged to either hospital-based SNFs or freestanding SNFs. It is the acute care sector, more than long-term care sector, that is under pressure to find post-discharge options for patients who still need skilled nursing care, so hospitals have begun to develop a continuum of services across care settings (Banaszak-Holl, Zinn, and Mor, 1996). Consequently, hospitals may play an important role in pressuring nursing homes to develop more options for subacute care. Particularly in markets with excess hospital capacity, where competition among hospitals for managed care contracts may be intense, SNFs may feel pressured to offer subacute care in response to hospital demand.

Hospital-based SNFs have more resources in personnel and equipment. Because both personnel and equipment are critical resources, according to the resource dependence theory, by owning more of those resources an organization will have more ability to cope with the changing environment. Hospital-based facilities are expected to

have higher admissions per bed than freestanding facilities do. The hospital higher cost structure, in addition to the higher rates paid to hospital facilities by Medicare, should facilitate admission of Medicare patients who, by definition, require post-acute care. Hospital-based facilities may also have higher case mix indices because of their ability to care for high acuity patients. Hospital-based subacute care ensures that hospitals have a place to transfer their inpatients to, so they can benefit from faster patient turnover (Burns, 1993). Having their own facility reduces hospitals' the transaction costs of placing patients in freestanding SNFs. Thus, the hypothesis is:

> H6: Hospital-based SNFs have a higher percentage of subacute care beds than freestanding SNFs.

## Physicians

Once nursing homes decide to increase the acuity level of their subacute care, the quality of their care becomes a concern. The difference between subacute care and traditional long-term care is that in subacute care, physicians should see patients more frequently. Current Medicare guidelines require physicians to see patients in long-term facilities once every 30 days, and reimburse them accordingly (Wolf, 1995). JCAHO also requires that attending physicians see long-term-care patients within the first 48 hours of their arrival or within the time warranted by their conditions; some patients may be seen within the first 24 hours (JCAHO, 1994; Wolf, 1995). When SNFs convert some beds for subacute patients, subacute care services must be administered by professional staff trained from acute care settings. Specialty physicians are needed, as well, to direct medical and rehabilitation programs in subacute care. Furthermore, JCAHO standards

require attending physicians to "closely and frequently monitor" patients in subacute care, because they are sicker than other nursing home residents.

Physicians are more involved than ever before in long-term care facilities, providing types of care including acute as well as rehabilitative, personal, and ambulatory. Physicians will visit patients more frequently on a subacute care unit than in traditional long-term care facilities. The medical directors in SNFs also are an important catalyst for the quality of care. They not only oversee clinical issues, but also carry out other, administrative duties that involve them in the broader aspects of life in a long term care facility (Fromhart, 1995). Thus, the medical director can be included in the number of the SNF's physicians.

> H7: SNFs with more physicians per 100 beds are associated with higher percentages of subacute care beds.

## Ancillary Staff

Because multi-dimensional services are common in SNFs, their ancillary services are important. Ancillary staff, such as physical therapists, registered dietitians, respiratory therapists, physical/occupational therapists, speech pathologists, pharmacists, and social workers, should have experience in treating patients with the specific diagnoses found in the subacute unit.

Many subacute SNFs contract out their ancillary therapies and services including speech therapy, occupational therapy, physical therapy, and respiratory therapy; and laboratory, radiology, oncology, and pharmacy services. Contracting out these services is prevalent among subacute SNF providers for financial reasons (DHHS, 1995); It costs

less to use contract ancillary staff than to hire a full-time staff. From the resource dependence perspective, contracting out for ancillary services is an exchange relationship to seek resource stability and financial benefit.

The hypothesis is:

H8: SNFs with more ancillary staff per 100 beds are associated with higher percentages of subacute care beds.

## Nursing Staff

A well-trained staff is a critical and scarce source for nursing homes that decide to offer subacute services. SNFs accepting more Medicare recipients increase their overall case-mix acuity and must develop facility-wide specialized staff and resources that differ fundamentally from the "core technology" of traditional long-term care settings (Banaszak-Holl, Zinn, and Mor, 1996). The subacute care staff must be more skilled in acute care, such as medical/surgical care, critical care, home care, pulmonary rehabilitation and oncology, than is required for traditional long-term care. There is an average of one RN for every 4-5 patients in a hospital, and an average of one RN for every 49 residents in a nursing home (Garfinkle, 1994). When the service scope changes, SNFs should adjust their staffing (Munroe, 1990). Subacute care averages over four nursing hours per patient day; thus, nursing homes that undertake it should use more RNs (Anders, 1994; Griffin, 1995; Kanda and Mezey, 1991). Other nursing staff such as LPNs are relatively less important in a subacute unit.

H9: SNFs with a higher ratio of RNs to LPNs are associated with higher percentages of subacute care beds.

## Summary

The theoretical framework for this research is based on the resource dependence perspective. The theory assumes that an organization has the ability to adapt to changing circumstances, but notes the limits or constraints imposed on those abilities by the environment (Cook et al., 1983). According to the resource dependence perspective, organizations do not merely respond to external constraints and control by complying with those environmental demands. The environmental demands are "filtered" through the organization's existing resource dependencies. The managers of organizations seek to maintain their discretion over the organization's activities, in part to maintain their own power and autonomy, and in part to permit adaptation as new contingencies arise.

This study applies the resource dependence theory to examine SNFs' development of their subacute care components. Environments are multidimensional and create uncertainty for organizations (Carter, 1990; Dess and Beard, 1984; Ungson, James, and Spicer, 1985). Generally, organizations respond to uncertainty or ambiguity by exchanging their resources with environments. In facing changes in their environments, SNFs are particularly vulnerable, so the appropriateness of their choices is especially crucial.

In this study, the environmental factors include implementation of the PPS, the growth of managed care, new technology, an aging population, multi-dimensional services competition, reimbursement changes from Medicare, Medicaid, and managed care, and CON regulations or moratoria on new construction. As these environmental

forces affect the availability of resources and the dependent relationships between organizations, SNFs will respond to them differently. Next, the methodology is presented to support the theoretical framework and to test the hypotheses proposed in this chapter.

# CHAPTER 4
# METHODOLOGY

The methodology used in this research is described in this chapter. This chapter includes discussions of the research design, the unit of analysis, the sampling plan, measurement of variables, data sources, and the data analysis plan.

## Research Design

The aim of this study was to identify nursing homes' responses to environmental factors in caring for subacute care patients. The study investigated the following research questions: 1) Have subacute care services increased over the 1992-1995 period? 2) What influence have environmental factors had on the level of subacute care services offered by SNFs? 3) What types of SNFs have developed higher levels of subacute care?

This was a non-experimental, longitudinal study, with the individual nursing home as the unit of analysis. Four years of time series data were pooled together to explore the research questions. Since changes in the severity of nursing home patients, conditions occurred after PPS implementation in from 1983 through 1986, the study selected four years of data subsequent to PPS implementation: 1992, 1993, 1994, and 1995. The reasons for choosing the most recent four years are: 1) Several empirical studies show evidence of PPS affecting on the utilization of nursing homes after 1987 (DesHarnais et al., 1988; Guterman et al., 1988; Kenney and Holahan, 1990). 2) Managed care has fostered the growth of subacute care services, especially since 1991 (DHHS. 1995; Fowler, 1992). 3) Surveys from the Health Care Financing

Administration (HCFA) did not include subacute care items until 1992 (DHHS, 1993). Descriptive and multivariate statistical analyses are conducted in this study.

## Unit of Analysis

The unit of analysis for this study is the individual nursing home. The nursing home is used, rather than the nursing home resident, because the study examines organizational adaptive behavior in terms of the number of subacute care beds. The OSCAR long-term care files were used to obtain information at the institutional level.

## Sample

The purpose of this study was to examine the nursing homes' adaptive behaviors for subacute care beds. It was necessary to collect data that represents the United States nursing home population. The study population is 16,000 to 17,000 for each year (DHHS, 1993). The population includes different providers: freestanding nursing homes, hospital-based skilled nursing homes, rehabilitation hospitals distinct-part units, long-term care hospitals, and hospital swing beds. The study sample included all SNFs that had one or more subacute care beds at least one year of the study period. The resulting sample comprises 1,471 nursing facilities in every year. Four years of observations for these facilities resulted in a total of 5,884 observations.

## Measurement

This section describes the measurement of each variable. A summary description of the variables can be found in Table 5. Variables are classified as dependent, independent, and control variables.

## Dependent Variable

### Percentage of Subacute Care Beds

This study used the definition from Banaszak-Holl et al.'s article to define total subacute care beds: it includes the numbers of beds in AIDS, dialysis, disabled children, head trauma, hospice, Huntington's, ventilator and special rehabilitation care (Banaszak-Holl, Zinn, and Mor, 1996). The percentage of subacute care beds was measured at the nursing home level and was calculated as the number of subacute care beds during a year, divided by the total beds in a nursing home during a year, multiplied by 100. Data were obtained from the OSCAR Long-term Care Files (DHHS, 1993). The description of OSCAR files can be found in the section on data sources (p. 88).

## Independent Variables

### Metropolitan Areas

Metropolitan area is a categorical variable. Because geographic variations exist in nursing facility utilization (Richardson and Kovner, 1986; Shaughnessy et al., 1990), it is necessary to control for the variation. Metropolitan area is measured by a nominal scale: one (1) codes for metropolitan area and zero (0) for non-metropolitan area.

### Certificate of Need (CON)/Moratoria

CON is measured at the state level. State variations in nursing facility bed supply are caused primarily by restrictive CON and moratoria regulations. Low bed supply and high occupancy rates give nursing facilities discretion to avoid admitting high-cost

Table 5

Variables, Operational Definitions, Associated Hypotheses, and Data Sources

| Variables | Operational Definitions | Hypotheses | Data Sources |
|---|---|---|---|
| **Dependent Variable** | | | |
| Percentage of subacute care beds | (subacute care beds / total SNF beds * 100%) | | OSCAR File |
| **Independent Variables** | | | |
| Metropolitan Areas | Whether a nursing home is located in metropolitan area<br>Categorical variable (1= Yes; 0 = No) | H1 | ARF File |
| Certificate of Need (CON)/Moratoria | Whether a nursing home is located in the states with a CON state or moratoria regulation<br>Categorical variable (0 = No; 1= either/both CON or/and moratoria) | H2 | Harrington & Swan, 1996 |
| Chain Affiliated (Multi-facility organizations) | Whether a nursing home is owned by multi-facility organization<br>Categorical variable (1 = Yes: 0 = No) | H3 | OSCAR File |
| Reimbursement | Whether a nursing home participates only in Medicaid reimbursement<br>Categorical variable (0 = Medicaid: 1= others) | H4 | POS File |
| Ownership | Nursing home ownership<br>Categorical variable<br>(0 = not-for-profit; 1 = for-profit) | H5 | OSCAR File |
| SNF type | Whether a nursing home is hospital-based<br>Categorical variable ( 1= Yes; 0 = No) | H6 | OSCAR File |
| Physicians[1] | Total number of physicians/total SNF beds *100<br>Numeric variable | H7 | POS File |
| Ancillary staff[2,3] | Ancillary staff /total SNF beds * 100<br>Numeric variable | H8 | POS File |
| Registered nurse[4] | Ratio of RNs to LPNs<br>Numeric variable | H9 | POS File |
| Time variable | 1 = 1992; 2 = 1993; 3 = 1994; 4 = 1995.<br>Numeric variable | | OSCAR File |
| **Control Variables** | | | |
| Elderly Population | Percentage of elderly population (65 & older)<br>Numeric variable | | Bureau of Census |
| Occupancy Rate | State average nursing homes' occupancy rate<br>Numeric variable | | Harrington et al.'s report, 1997 |

Note: 1. Total number of physicians = (1.0 * number of full-time[5] physicians) + (0.5 * number of part-time[6] physicians) + (0.25 * number of contracting[7] physicians).

2. Total number of ancillary staff = (1.0 * number of full-time[5] ancillary staff) + (0.5 * number of part-time[6] ancillary staff) + (0.25 * number of contracting[7] ancillary staff).

3. Ancillary staff include the sum of the numbers of all physical therapies, registered dietitians, occupational therapists, speech therapists, pharmacists, and social workers.

4. Total number of RNs = (1.0 * number of full-time[5] RNs) + (0.5 * number of part-time[6] RNs) + 0.25 * number of contracting[7] RNs ).

5. Full-time is defined as 35 or more hours worked per week.

6. Part-time is defined as less than 35 hours per week.

7. Contract includes individuals under contract as well as organizations under contract.

subacute patients (Griffin. 1995). Although subacute care is not directly regulated by CON, CON is nonetheless a constraint on nursing facility development. It is possible that a state with CON regulation differs in its nursing facility capacity from a state without this regulation, in terms of the facilities' percentages of subacute care patients. CON/moratoria variable is coded as one (1) if a SNF is located in an active CON/moratoria state; otherwise it is coded as zero (0).

### Chain Affiliated (Owned by a Multi-Facility Organization)

An affiliated nursing facility is defined as a facility owned by an organization that owns (or leases) two or more nursing facilities. An institution owned by a multi-facility organization commands greater internal resources, including a larger administrative staff that can devote attention to strategic issues, and may be more capable of accommodating environmental demands than an independent facility would be. Chain-affiliated organizations can also signify greater access to capital for diversification, providing flexibility in responding to the needs of a changing environment (Banaszak-Holl et al., 1996). If a nursing home is owned by a multi-facility organization, it is coded as one; it is coded as zero otherwise. The data for this variable also came from the OSCAR Long-term Care file.

### Reimbursement

Restrictive Medicaid reimbursement policies are a major constraint on bed supply in the nursing home market. In most states, Medicaid reimbursement does not cover the full cost of treating subacute patients (Knapp, 1995). In this study, reimbursement is

measured in two categories: zero (0) if the SNF participates only in Medicaid program reimbursement. and one (1) if the SNF participates in other programs such as Medicare or both. The data source for this variable is the POS Files.

### Ownership

Ownership is measured by not-for-profit (0), and for-profit (1). It is expected that the different ownership types have different missions and needs for autonomy, which could affect institutions' willingness to treat subacute patients (Zinn and Mor, 1994).

### SNF Type

SNF type is a categorical variable in this study. It is coded as zero (0) for freestanding SNFs and one (1) for hospital-based SNFs. Data for this variable were obtained from the OSCAR files. Rehabilitation hospitals are classified as one type of hospital-based SNF.

### Number of Physicians per 100 beds

The percentage of physicians per 100 SNF beds can be calculated as the ratio of total number of physicians to total SNF beds, multiplied by 100. Data for this variable were collected from the POS File. Physicians play an important role in subacute care services. so the higher the ratio of physicians to the total number of patients, the better the facility's capacity to admit subacute care patients. The medical directors of SNFs are included in the calculation. The number of full-time equivalent physicians includes those the SNF employs a full-time, part-time, or on contract. HCFA defined full-time as thirty five or more hours worked per week and part-time as less than thirty-five hours per week

(HCFA, 1992, 1993, 1994, 1995). Contract includes individuals under contract (e.g. a physical therapist) as well as organizations under contract (e.g., an agency to provide nurses) week (HCFA, 1992, 1993, 1994, 1995). Full-time physicians were assigned a weight of one, part-time FTEs a weight of 0.5, and contracting FTEs a weight of 0.25 (Ozcan, Luke, and Haksever, 1992). The computation of the full-time equivalents (FTEs) is as follows:

FTEs of physicians = (1.0 * number of full-time physicians) + (0.5 * number of part-time physicians) + (0.25 * number of contracting physicians).

Number of Ancillary Staff per 100 Beds

The number of ancillary staff per 100 SNF beds is measured by the sum of the numbers of all physical therapists, registered dietitians, occupational therapists, speech therapists, pharmacists, and social workers, divided by total SNF beds, multiplied by 100. Data on these items were extracted directly from the POS File. Since some of the SNFs employ more contracting and part-time ancillary staff than full-time ancillary staff (Cook, 1993), the contracting and also the part-time ancillary staff are included in this measure. Thus, the full-time equivalents of ancillary staff are computed as follows:

FTEs of ancillary staff = (1.0 * number of full-time ancillary staff) + (0.5 * number of part-time ancillary staff ) + (0.25 * number of contracting ancillary staff).

Registered Nurses/Licensed Practical Nurses

RNs/LPNs is a numeric variable. Because subacute care averages over four nursing hours per patient day (Gill and Balsano, 1994; Griffin, 1995), RNs are the major

staff in subacute care units. RNs are presumed to have more intensive care skills and knowledge than LPNs (Burk, 1994; Munroe, 1990). The ratio of RNs/LPNs is measured as the total RN employees divided by the total LPN employees. Generally, part-time and contract employees are in the nursing home market; thus, it is necessary to include them in the calculation process. The computation of full-time equivalents include the numbers of full-time, part-time, and contracting RNs. Full-time RNs and full-time LPNs are assigned a weight of one (1), part-time FTEs a weight of 0.5, and contracting FTEs a weight of 0.25 (Ozcan, Luke, and Haksever, 1992). The computation process is as follows:

FTEs of RNs = (1.0 * Number of full-time RNs) + (0.5 * Number of part-time RNs) + (0.25 * Number of contracting RNs).

FTEs of LPNs = (1.0 * Number of full-time LPNs) + (0.5 * Number of part-time LPNs) + (0.25* Number of contracting LPNs).

### Time variable

The time variable is a continuous variable. Since the study uses four-year data, the time variable is defined as one (1) for 1992, two (2) for 1993, three (3) for 1994, and four (4) for 1995.

## Control Variables

### Elderly Population

The elderly population is measured as a continuous variable in this study. It is measured by percentage of elderly population (65 years old or older). It is presumed that

the need for nursing home services increases in an area with a high density of aging population. Thus, it is necessary to control the aging factor. The data are from the U.S. Bureau of the Census.

### Occupancy Rate

Occupancy rate is a continuous variable in this study. The study treated the occupancy rate as a competitive index. State average occupancy rate is used in the model. The data are from Harrington et al.'s report (Harrington, Carrillo, Thollaug, and Summers, 1997).

## Data Sources

This study used several data sources. The OSCAR Long-term Care Files for 1992, 1993, 1994, and 1995 were the primary data sources. The POS Files for 1992, 1993, 1994, and 1995 were the second data source. The POS File is a subset of data from the OSCAR. The POS File is created by extracting data from OSCAR quarterly.

OSCAR data are collected through surveys of nursing homes and other health care facilities by the HCFA. The purpose of the OSCAR survey is to examine whether an institution is qualified to furnish safe and effective care to Medicare and Medicaid beneficiaries. After initial certification, an institution's qualifications are reviewed periodically to support the decision by HCFA to retain or terminate the institution's participation in the Medicare and Medicaid programs (DHHS, 1993). All Medicare and Medicaid providers, including hospitals, long-term care facilities (SNF/NF/ICF), home health agencies (HHAs), and some suppliers, are included in the survey (DHHS, 1993).

This study included both freestanding nursing homes and hospital-based skilled nursing facilities or units.

The OSCAR Long-term Care File contains a volume of descriptive information about providers that includes such facility and service characteristics as provider number, total staffing, number of beds, ownership, types of services and location. Because the provider is the unit of analysis in the OSCAR File, variables such as number of subacute care beds, multi-facility organization, ownership, SNF type, and total number of SNF beds are extracted from the OSCAR Long-term Care File. Other variables - reimbursement, number of physicians, ratio of RNs to LPNs, and number of ancillary staff - come from the POS File.

In order to test the "location" variable, the OSCAR data file is merged with local market area data obtained from the 1996 ARF. The OSCAR files contain a "county code" that can be found in the ARF data file to distinguish whether a nursing home is located in a metropolitan or non-metropolitan area. Measures for CON/moratoria and state average occupancy rate were taken from Harrington et al.'s reports (Harrington, Carrillo, Thollaug, and Summers, 1997; Harrington, DuNah, and Curtis, 1994). Data for elderly population are from the U.S. Bureau of the Census.

## Statistical Treatment of Missing Data

The major source of the data is HCFA's survey, which is required by regulations (DHHS, 1993). However, certain data are missing. The dependent variable represents the outcome or effect of the independent variables; when the dependent variable contains

a missing value, dropping the case with a missing value is the choice (Cohen and Cohen, 1975).

In order to explain how independent variables with missing data are handled, it is necessary first to explain the two types of data in the study. First are qualitative data for the categorical variables. The best way to manage categorical variables with missing data is to recode the data either by adding another, "no response" category (the missing data matrix method) or by making the variable dichotomous (Cohen and Cohen, 1975). However, when only a small proportion (0.05 or 0.10) of the sample has missing data for an independent variable, incorporating the information is likely be outweighed by fixing the missing data (Bohrnstedt and Knoke, 1988). This is so because the variance is relatively small (Cohen and Cohen, 1975). Since this study uses survey data, it is possible for the same subject to have missing data for several items (nonrandomly missing). When that is the case, the missing data matrix method can be used only for the first scale; the second, third, and other scales must be dropped. For the quantitative scales (numeric variables) with missing data, replacing the blanks with mean, median, or mode is the appropriate strategy (Cohen and Cohen, 1975).

## Data Analysis

### Univariate Analysis

Descriptive statistics are computed for each variable, measured from Time 1 (1992) to Time 4 (1995), including mean and standard deviations. Generally, means are

used to test central tendency. Central Limit Theorem states that whenever sample size (n) is moderately large, means ($\bar{x}$) have approximately a normal distribution, regardless of the distribution of the underlying variable x (Kleinbaum, Kupper, and Muller, 1988). Measures of central tendency(such as means), however, are not sufficient to examine all features of data. Thus, in addition to means ($\bar{x}$), measures of variability are necessary to tell the extent to which the values of the measurements in the sample differ from one another (Stoodley, Lewis, and Stainton, 1980). Standard deviation is one of the measures of variability.

The data are analyzed to detect any departure from normal distributions by evaluating skewness, kurtosis, and the Shapiro-Wilk (W) or Kolmogorov (D) statistic. The W statistic is computed when the sample size is less than or equal to 2,000. If the sample size is greater than 2,000, the data are tested by the D statistic. If the distribution of the data does not satisfy the normal distribution, the non-normal data are transformed, that is re-expressed in different units (Johnson, 1992). This study performed the optimal power transformation by using PROC PRINQUAL to improve the symmetry about the mean. Finally, the study examined the Q-Q plot to see if the tentative normal assumption is satisfactory.

Tests of normality are necessary to assess the appropriateness of maximum likelihood and general least squares estimators. Skewness values greater than zero indicate positive skewness (long tail extending to the right), and values less than zero indicate negative skewness (long tail extending to the left) (Canavos and Miller, 1995). Values for kurtosis greater than three indicate a problem with positive kurtosis (thinner

tails), and values less than three indicate negative kurtosis (fatter tails) (Canavos and Miller, 1995). The test statistics, W or D, must be greater than zero and less than or equal to one, with small values of W leading to rejection of the null hypothesis of normality (SAS Institute, 1990). However, if the distribution of W is highly skewed, seemingly large values of W (such as 0.90) may be considered small and lead to rejection of the null hypothesis (Kleinbaum, Kupper, and Muller, 1988; SAS Institute, 1990).

## Multivariate Analysis

### Trend Analysis

Trend analysis is used here to describe the growth of subacute care services . A trend is the long-term movement in a time series. The first step should reveal whether or not the trend can be assumed to be linear. The linear trend is written $y_t = a + b_t + e_t$, where $t$ is a measure of time and $e_t$ is a random error term. The graph of $y_t$ against $t$ will be a straight line, and the values of the constants can be determined from the $(t, y)$ coordinates of any two points on the time. Often a graph of the time-series data indicates whether or not this linear relationship is a good approximation of the long-term movement of the series. In this study, the graph indicates whether subacute care services are growing each year. If a linear relationship is appropriate, then there are several methods for approximating the measure of time (T). A fairly accurate approximation can be obtained merely by drawing the line that best seems to represent the long-run movement of the points (Harnett and Murphy, 1985). Because the method of least

squares analysis is the most popular method of fitting a trend line to time-series data. is applied in this study.

It is important to define the units of the time variable *t* and to scale this variable. Since time is continuous, however, it really makes little difference if the units used to express time are years, quarters, months, or weeks (Harnett and Murphy, 1985; Stoodley, Lewis, and Stainton, 1980). This study used data from four years with annual values.

## Autocorrelation

An autocorrelation is the correlation between measurements taken at times t and at t-1. Autocorrelation occurs more frequently in time-series studies in which data are collected on variables over a period of time. It is necessary to detect the autocorrelation, because the study has four-year time series data.

The study used the Durbin-Watson (DW) statistic to diagnose autocorrelation. The Durbin-Watson statistic is an indicator of the relationship between adjacent residuals (Canavos and Miller, 1995); that is, how one residual is related to the previous residual. The Durbin-Watson statistic is designed to test the null hypothesis that there is no first-order autocorrelation among the error terms. If the errors are truly independent, the value of DW should lie near 2.0. The range of DW is from zero to four, with a value under two suggesting positive autocorrelation, and a value over two negative autocorrelation (Harnett and Murphy, 1985).

## Pooled Cross-Sectional and Time Series Data Analysis

In the econometrics literature, a data base that provides a multivariate statistical history for each of a number of individual entities is called a pooled cross-sectional and time series data base (Dielman,1989). Pooled data means any data base describing each of a number of individuals across a sequence of time periods (Dielman,1989). A pooled data base blends characteristics of both cross-sectional and time series data. Like cross-sectional data, it describes each of a number of individuals. Like time series data, it describes each single individual through time. Pooled data contain the information necessary to deal with both the inter-temporal dynamics and the individuality of the entities being investigated.

As Klein (1953) points out, when a researcher analyzes data pertaining to a number of individuals, one possibility is that the underlying relationship between an independent and the dependent variable may be different for different individuals (Klein, 1953). The use of pooled data allows us to model these differences and estimate individual response coefficients or average responses for the group.

There are several problems associated with the estimating of regression equations that describe the behavior of individuals over time. In a single time series equation, researchers often encounter the problem of autocorrelated errors (Dielman,1989). The autocorrelated errors will adversely affect the efficiency of ordinary least-squares (OLS) parameter estimates and cause standard error estimates to be biased (SAS Institute, 1993). In a single cross-sectional regression equation, investigators may have problems with nonconstant error variance (Nerlone, Grether, and Carvalho, 1995). When combining

cross-sectional and time series data, both problems may occur simultaneously. In addition, cross-sectional disturbances for different individuals at the same point in time may be correlated. Such contemporaneous correlation is an added problem specific to the analysis of pooled data.

When estimating a time series equation for a single cross-sectional unit, researchers may find that a regression coefficient changes over time (either systematically or randomly). This can also be the case when pooling time series for several individual nursing homes. As when cross-sectional relationships between a dependent and an independent variable differ between individual nursing homes, they may be a relationship between a dependent and an independent variable that changes over time, or we can have both changes occurring simultaneously.

Since this study used four years of time series data, it is possible to have the autocorrelated problems. Therefore, this study applied two procedures to analyze panel data sets that consist of multiple time series observations on each of several individuals or cross-sectional units (SAS/ETS, 1993). The first procedure is time series cross section regression (TSCSREG), and the second is the seemingly unrelated regression (SUR) model.

### Time series cross-section regression (TSCSREG).

The time series cross-section regression incorporates a model for the structure of the random errors. TSCSREG models can be viewed as two-way designs with covariates, as follows:

$$Y_{it} = \sum_{k=1}^{p} X'_{itk}\beta + \mu_{it} \qquad I = 1, \ldots, N; \; t = 1, \ldots, T$$

where, $Y_{it}$ = is the value of the dependent variable (% of subacute care services) for nursing home $i$ at time $t$.

$X'_{it} = (x_{it1}, \ldots, x_{itp})$ is a vector of explanatory variables[1] for the $t$th time point and $i$th nursing home. The explanatory variables are the followings

$X_1$ = *Chain*
$X_2$ = *SNF Type*
$X_3$ = *Reimbursement*
$X_4$ = *Ownership*
$X_5$ =*Metropolitan*
$X_6$ = *CON*
$X_7$ = *RN/LPN*
$X_8$ = *Physicians/total SNF beds*
$X_9$ = *Ancillary staff/ total SNF beds*
$X_{10}$ = *Occupancy rate*
$X_{11}$ = *OLD*
$X_{12}$ = *TIME.*

$\beta = (\beta_1, \ldots, \beta_p)'$ is the vector of parameter.

N is the number of cross sections.

T is the length of the time series for each cross section.

p is the number of independent variables.

$\mu$ is the error structures.

This study uses the following two error structures and corresponding methods to analyze the error structures:

*(1) Variance Components (or error components) Model (Fuller-Battese method)*

This error structure is similar to a two-way random effects model with covariates. The variance components are estimated by the fitting-of-constants

method, and the regression parameters are estimated with generalized least squares (GLS).

$\mu_{it} = v_i + e_t + \varepsilon_{it}$,

with $i = 1, 1\ldots, CS$, $t = 1, 2\ldots, TS$, and

where $\varepsilon_{it}$ is a classical error term with zero mean and a homoscedastic covariance matrix,

With $v_i$, $e_t$, $\varepsilon_{it}$ independently distributed with zero means and variances $\sigma_v^2 \geq 0$, $\sigma_e^2 \geq 0$, and $\sigma_\varepsilon^2 > 0$, respectively.

The components satisfy the following condition:

$E(v_i e_t) = E(v_i e_{it}) = E(e_t \varepsilon_{it}) = 0.$

The random errors are homoscedastic, with variance given by Var $(\mu_{it}) = \sigma^2 = \sigma_v^2 = \sigma_\varepsilon^2 = \sigma_e^2$. The covariance matrix for the vector of random errors can be given as:

$E(\mu\mu') = V = \sigma_\varepsilon^2 I_{NT} + \sigma_v^2 A + \sigma_e^2 B$

where A is the direct product matrix of $I_N$ *and* $t_T$;

B is the direct product matrix of $t_N$ *and* $I_T$;

$I_{NT}$, $I_N$, and $I_T$ are the identity matrices of order *NT*;

*N* and *T*, respectively, and $t_N$ and $t_T$ are $N \times N$ and $T \times T$ matrices, respectively, having all elements equal to one.

Given such an error structure, the variance components in *V* are estimated by the fitting of constants' method, subject to the provision that any negative variance component is set to zero for parameter estimation purposes (Wilbur, Miller, and Brown,

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[1] Please refer to the operational definition in Table 5.

1985). Since the variance components $\sigma_v^2$, $\sigma_\varepsilon^2$, $\sigma_e^2$ are unknown, the GLS estimator cannot be computed, and the estimated GLS estimator is substituted.

$$\hat{\beta} = (X'\hat{V}^{-1}X)^{-1'}\hat{V}^{-1}Y.$$

$\hat{V}$ denotes a consistent estimator of the covariance matrix for the crossed error model. The procedure requires that the OLS estimate of β be found, with the residuals used to find $\hat{V}$. The estimated GLS estimator with estimated covariance matrix is unbiased for β if (1) the errors are symmetric about zero and have fourth moments and (2) the expectation of $(\sigma_\varepsilon^2)^{-1}$ exists.

*(2) Mixed Variance-Component Moving Average Error Process (Da Silva Method)*

This model is used to estimate the mixed variance-component moving average model and the regression parameters, using a two-step GLS-type estimator.

$\mu_{it} = a_i + b_t + e_{it}$.

$e_{it} = \alpha_0\varepsilon_t + \alpha_0\varepsilon_{t-1} + \ldots + \alpha_m\varepsilon_{t-m}$.

where, $a_i$ is a unit-invariant, cross-sectional unit effect;

$b_t$ is a cross-sectional invariant time effect;

$e_{it}$ is a residual effect unaccounted for by the explanatory variables and the specific time and cross-sectional unit effects.

Seemingly Unrelated Regression (SUR) Model.

The second procedure used is the Seemingly Unrelated Regression (SUR) model. In a multivariate regression model, the errors in different equations may be correlated. In

that case the efficiency of the estimation may be improved by taking the cross-sectional correlations into account (Zellner, 1978). The seemingly unrelated regression (SUR) model is a generalization of OLS estimation for multi-equation systems. The SUR method assumes that all regressors are independent variables, but uses the correlations among the errors in different equations to improve the regression estimates (Breusch, 1987; SAS Institute, 1993).

$Yi = X_i\beta_i + \varepsilon_i.$

where, $i = 1, \ldots, N$

$\varepsilon_i$ is the error structures;

$\beta i$ is the coefficient vectors;

$X_i$ is a fixed matrix in repeated samples.

The SUR model assumes that coefficients differ between cross-sectional units, and that disturbances (error) measured at the same point in time are correlated between different cross-sections. This correlation between disturbances of different cross-sections at the same point in time is called contemporaneous correlation (Dielman, 1989). When several separate equation regressions are estimated, the disturbances at a given point in time may be expected to reflect some common unmeasurable or omitted influences. Contemporaneous correlation could be the result of these common factors that are not included in the regressions. The SUR model may improve the efficiency of parameter estimates when there is contemporaneous correlation of errors across equations. The SUR method requires an initial OLS regression to compute residuals. The OLS residuals are used to estimate the cross-equation covariance matrix. On the other hand, under the

following circumstances, the SUR parameter estimates are the same as those produced by OLS: 1) when there is no contemporaneous correlation of errors across equations (the estimate of contemporaneous correlation matrix is diagonal), and 2) when the independent variables are the same across equations (Baltagi, 1980; SAS Institute, 1993; Zellner, 1978).

Goodness of Fit Statistics.

Both TSCSREG and the SUR model analyze parameters by using the GLS (Breusch, 1987; SAS Institute, 1993). GLS is an estimate to obtain linear unbiased estimates in which the variances of the estimates are smaller than that for OLS estimators. GLS corrects the violation of the assumption that any two of the errors $\varepsilon_i$ and $\varepsilon_t$ are independent (i.e., their covariance is zero), by including calculation information about the variances and covariances of the error terms $\varepsilon_i$ (Harnett and Murphy, 1985). This information is usually obtained through analysis of the residuals $e_i$ from a first OLS estimation of the regression model. The purpose is to generate a new model whose error terms are free of the violations of the assumption described above.

For random effects models in the TECSREG procedure, the estimation method is an estimated generalized least squares (EGLS) procedure that estimates the variance components in the first stage, and uses the estimated variance covariance matrix thus obtained to apply GLS to the data (Maddal, 1971; Nerlove, 1971; SAS institute, 1993). The results include a model description, the variance components estimates, and parameter estimates. A model description reports the estimation method used and the number of cross sections and time periods. The regression parameter estimates include

the degree of freedom. the parameter estimate, the standard error of the estimate, a *t* statistic for testing whether the estimate is significantly different from 0, and the significance probability of the *t* statistic.

The goodness-of-fit measure, Buse R-squared measure, for TSCSREG models is estimated by using GLS. The Buse R-squared is similar to the R-squared measure in OLS estimation. The number of Buse R-Square is interpreted as a measure of that proportion of the transformed sum of the squares of the dependent variable that is attributable to the influence of the independent variables (SAS Institute, 1993).

$R^2$ in the SUR model from the SYSLIN procedure is defined as $R^2 = (RSS/RSS+ESS)$. The definition is consistent with the $F$-test of the null hypothesis that the true coefficients of all regressors are zero. However, according to Zellner, this $R^2$ may not be a good measure of the goodness of fit of the model (Zellner, 19678). The system- weighted $R^2$ from the SYSLIN procedure is computed as follows:

$$R^2 = \frac{Y'WR(X'X)-1R'WY}{Y'WY}.$$

In this equation, the matrix X'X is R'WR, and W is the projection matrix of the instruments: $W = S^{-1} \otimes Z(Z'Z)^{-1}Z'$.

The matrix Z is the instrument set, R is the regressor set, and S is the estimated cross model covariance matrix (SAS Institute, 1993).

The system-weighted MSE for the SUR model is computed as follows:

$$MSE = 1/tdf\,(Y'WY - Y'WR(X'X)^{-1}R'WY).$$

In this equation, tdf is the sum of the error degrees of freedom for the equations in the system.

### Multicollinearity

Multicollinearity refers to the high correlation among two or more independent variables that may cause the effects of the independent variables to be confounded by each other (Hair et al., 1992). Multicollinearity results in inaccurate computation of the estimates of the coefficients, the estimates of standard errors, and hypothesis test statistics; and also limits the size of R-square. Thus, multicollinearity problems are examined before using TSCSREG to test the hypotheses. Multicollinearity is examined by using these techniques: bivariate correlation, coefficient of determination, factor analysis, variation inflation factor (VIF), condition index, condition number, and variation proportion (Hair et al., 1992; Kleinbaum, Kupper, and Muller, 1988; SAS, 1990).

## Summary

This longitudinal study of SNFs answers the following research questions: 1) Have subacute care services increased from 1992 through 1995 ? 2) What impact have environmental factors had on the levels of subacute care services offered by SNFs? 3) What types of SNFs have developed higher levels of subacute care?

Methods used in this study include descriptive analysis, trend analysis, and time series cross sectional regression. The OSCAR Long-Term Care file, the major data source for this study, includes almost all Medicare and Medicaid providers, which account for 70% of the patients in SNFs (Griffin, 1995). Thus, it is possible to generalize the study results to the nursing home industry in terms of external validity. Trend

analysis was used to quantify the recent growth of subacute care in SNFs. The time series cross-section regression analysis (both TSCSREG and SUR) explores the relationships between environmental factors and the levels of subacute care services, by solving the problems of autocorrelated errors and nonconstant error variance.

# CHAPTER 5
# RESULTS

This chapter contains the results of the empirical analysis. Descriptive statistics, trend analysis, and the results from the time-series cross-section regression analysis of different models are presented.

## Descriptive Statistics

The means, standard deviations, and range for the continuous variables used in the time-series cross-section analysis are presented in Tables 6 to 15. Univariate analysis for the variance component model is displayed in Table 6. Table 6 also contains skewness and kurtosis statistics for the continuous variables. Skewness values near zero indicate no skewness, and kurtosis values less than three indicate an acceptable level of kurtosis. As seen in Table 6, all of the continuous variables have problems with skewness and kurtosis, except for the percentage of subacute care beds (PROSUB), occupancy rate (OCC), and elderly population (OLD) variables.

Table 7 describes the frequency statistics for the categorical variables. There were 16,224 individual nursing facilities in the United States in 1992, 16,464 in 1993, 16,860 in 1994, and 17,021 in 1995. The study sample includes all SNFs that had one or more subacute care beds at least one year of the study period. They might have offered the subacute care services in the first year and then stopped the services in the following years, or vice versa. The resulting sample comprises 1,471 different nursing facilities each year. Four years of the observations for these facilities resulted in a total of 5,884 observations. About 15 percent of the sample provide one to ten subacute care beds,

Table 6
Univariate Summary Statistics for Continuous Variables, 1992-1995 Pooled Data (n = 5,884)

| Variables[1] | Mean | St. Dev.[2] | Skewness | Kurtosis | D-Normal[3] | Minimum | Maximum |
|---|---|---|---|---|---|---|---|
| PROSUB | 14.82 | 26.36 | 2.32 | 4.51 | 0.287* | 0 | 100 |
| RN | 1204.19 | 4102.92 | 16.91 | 350.22 | 0.385* | 0 | 10547.75 |
| LPN | 1990.84 | 6306.76 | 12.04 | 163.99 | 0.376* | 0 | 17943 |
| RN_LPN | 1.10 | 3.36 | 16.51 | 364.03 | 0.372* | 0 | 109.5 |
| MD | 24.53 | 375.99 | 1217.95 | 1217.95 | 0.474* | 0 | 14285.75 |
| DR | 43.11 | 1022.95 | 53.15 | 3152.82 | 0.483* | 0 | 65892.75 |
| PH | 21.89 | 99.60 | 21.24 | 676.88 | 0.413* | 0 | 3663.24 |
| OT | 99.21 | 894.59 | 41.65 | 2201.40 | 0.456* | 0 | 52857 |
| PT | 120.24 | 614.81 | 20.53 | 547.83 | 0.422* | 0 | 23286 |
| ST | 63.09 | 562.70 | 29.31 | 986.26 | 0.455* | 0 | 22857 |
| DRUG | 42.19 | 423.36 | 28.84 | 947.81 | 0.460* | 0 | 16400 |
| SOCIAL | 283.84 | 1583.27 | 18.87 | 423.07 | 0.429* | 0 | 42898.25 |
| DIET | 82.01 | 517.86 | 20.46 | 458.18 | 0.437* | 0 | 12856.75 |
| ANCILL | 461.42 | 2108.34 | 32.36 | 1306.56 | 0.413* | 0 | 92663.39 |
| TOTBED | 138.98 | 96.82 | 3.33 | 21.19 | 0.138* | 6 | 1202 |
| OCC | 86.78 | 5.74 | -0.54 | -0.26 | 0.076* | 72.4 | 97 |
| OLD | 13.06 | 2.20 | 0.986 | 1.251 | 0.196* | 8.8 | 19 |

[1] Please refer to Appendix B (p.208) for abbreviations of variables and their definitions

[2] St. Dev. = Standard Deviation

[3] D-Normal: Kolmogorov D statistic

* $p < 0.05$.

Table 7
Frequency Statistics for Ordinal Variables, 1992-1995 Pooled Data
(n = 5,884)

| Variables[1] | | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|---|---|---|---|---|---|
| HOSPBASE | | | | | |
| | 0 | 5,084 | 86.4 | 5,084 | 86.4 |
| | 1 | 800 | 13.6 | 5,884 | 100.0 |
| CHAIN | | | | | |
| | 0 | 2,487 | 42.3 | 2,487 | 42.3 |
| | 1 | 3,397 | 57.7 | 5,884 | 100.0 |
| PROFIT | | | | | |
| | 0 | 1,761 | 29.9 | 1,761 | 29.9 |
| | 1 | 4,123 | 70.1 | 5,884 | 100.0 |
| REIM | | | | | |
| | 0 | 436 | 7.4 | 436 | 7.4 |
| | 1 | 5,439 | 92.6 | 5,875 | 100.0 |
| METRO | | | | | |
| | 0 | 1,059 | 18 | 1,059 | 18.0 |
| | 1 | 4,825 | 82 | 5,884 | 100.0 |
| CON | | | | | |
| | 0 | 1,024 | 17.4 | 1,024 | 17.4 |
| | 1 | 4,860 | 82.6 | 5,884 | 100.0 |

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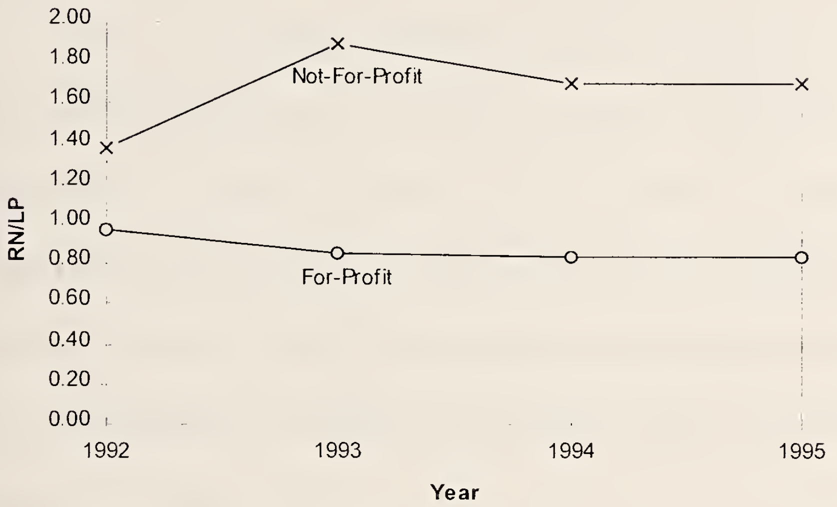
[1] Please refer to Appendix B (p.208) for abbreviations of variables and their definitions

29 percent between eleven and fifty subacute care beds. 6 percent between fifty-one and one hundred beds, and 3 percent provide more than one hundred beds. Most of the subacute services are provided in the state of California, with 12.7 percent, followed by 6.7 percent in Illinois, 6.6 percent in Florida, and 5.4 percent in Ohio. Less subacute care services are provided in New Mexico (0.2%), Vermont (0.2%). Wyoming (0.3%), and South Dakota (0.3%).

From all four years, there are 800 observations from the 200 hospital-based SNFs, and there are 5,084 observations from the 1,271 freestanding SNFs. About 42 percent are owned by multi-facility organizations, and 57.7 percent are independent (Table 7). The freestanding nursing homes are more likely to be affiliated with a chain; 61 percent of the freestanding nursing homes are affiliated with a chain, compared to 38 percent of hospital-based nursing homes.

Eighty-two percent of the facilities are located in metropolitan areas, and 18 percent in non-metropolitan areas. The different ownerships of the organizations are distributed as follows: 29.9 percent NFP and 70.1 percent FP nursing homes (Table 7). Those participating only in the Medicaid program comprise 7.4 percent of the sample; 92.6 percent participate in other programs, such as Medicare or both Medicare and Medicaid (Table 7). Figure 9 shows that NFP nursing homes have the ratios of RNs to LPNs of 1.38 in 1992 to 1.69 in 1995, as compared to FP nursing homes, with RN ratios of 0.97 in 1992 and 0.83 in 1995. Clearly, NFP nursing homes have higher ratios of RNs to LPNs than FP nursing homes. Interestingly, FP nursing homes are much more likely than NFP nursing homes to be owned by chains.

Figure 9. The Ratio of RNs to LPNs in Nursing Facilities, by Ownership
1992-1995



Around 68 percent of the FP nursing homes are affiliated with a chain, but less than 40 percent of the NFP are affiliated with a chain. The percentage of the nursing homes that are in states without any CON regulation or moratoria on construction is 17.4 percent. The percentage in states with either/both CON or/and moratoria is 82.6 percent.

The test for normality is computed using the Kolmogorov D statistic (D-normal) for the null hypothesis that the data values are a random sample from a normal distribution. The *p*-value indicates that the null hypothesis is rejected for every continuous variable in Table 6. Therefore, transformation of the data was necessary in this study. This study uses the power optimal transformation function to transform the data and the transformed results indicated that the ancillary staff were transformed to logarithm of ancillary staff.

The descriptive analysis including univariate and frequency analyses for the SUR model by each year, is presented in Tables 8 to 15. The univariate tables also include the normality statistics by Shapiro-Wilk Statistic (W-normal) for the null-hypothesis that the nursing home data are from a normal distribution. As seen in the tables, all W-normal statistics are rejected at 0.05 level, indicating that the data are not normally distributed from 1992 to 1995. Only the PROSUB (percentage of subacute care beds), occupancy rate (OCC), and OLD (elderly population greater than 65) variables are in the acceptable range for skewness and kurtosis.

A matrix of Pearson's and Spearman's correlations is presented in Appendix C, D, E, F, and G. Pearson's correlations are computed between two continuous variables, and Spearman's correlations are computed between two categorical variables. In Appendix C,

Table 8
Univariate Summary Statistics for Continuous Variables, 1992
(n = 1,471)

| Variables[1] | Mean | St. Dev. | Skewness | Kurtosis | W-Normal | Min. | Max. |
|---|---|---|---|---|---|---|---|
| PROSUB | 12.44 | 25.26 | 2.57 | 5.74 | 0.537* | 0 | 100 |
| RN | 1037.06 | 3215.49 | 21.91 | 629.24 | 0.219* | 0 | 9545.97 |
| LPN | 1876.55 | 5915.65 | 11.85 | 158.16 | 0.195* | 0 | 17943 |
| RN_LPN | 1.09 | 3.95 | 19.09 | 451.73 | 0.183* | 0 | 109.5 |
| MD | 15.98 | 59.88 | 12.54 | 205.06 | 0.249* | 0 | 1206.25 |
| DR | 59.60 | 1043.14 | 28.34 | 843.22 | 0.050* | 0 | 660.75 |
| PH | 24.51 | 88.66 | 14.84 | 349.89 | 0.287* | 0 | 2383.33 |
| OT | 101.69 | 1418.64 | 35.49 | 1312.89 | 0.058* | 0 | 9671 |
| PT | 102.41 | 693.76 | 27.50 | 874.80 | 0.118* | 0 | 8800 |
| ST | 56.73 | 642.13 | 32.03 | 1105.68 | 0.072* | 0 | 8000 |
| DRUG | 47.63 | 468.79 | 29.85 | 1018.65 | 0.093* | 0 | 3262.5 |
| SOCIAL | 233.75 | 999.65 | 14.32 | 245.12 | 0.160* | 0 | 1631 |
| DIET | 67.56 | 348.84 | 25.17 | 783.45 | 0.171* | 0 | 4000 |
| ANCILL | 388.11 | 1445.84 | 26.15 | 831.00 | 0.180* | 0 | 16060 |
| TOTBED | 137.48 | 96.17 | 3.34 | 21.61 | 0.777* | 6 | 1202 |
| OCC | 87.80 | 5.16 | -0.48 | -0.57 | 0.926* | 77.3 | 96.6 |
| OLD | 13.06 | 2.20 | 0.99 | 1.26 | 0.868* | 8.8 | 19 |

[1] Please refer to Appendix B (p.208) for abbreviations of variables and their definitions
* $p < 0.05$.

Table 9
Frequency Statistics for Ordinal Variables, 1992
(n = 1,471)

| Variables[1] | | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|---|---|---|---|---|---|
| HOSPBASE | | | | | |
| | 0 | 1,271 | 86.4 | 1,271 | 86.4 |
| | 1 | 200 | 13.6 | 1,471 | 100.0 |
| CHAIN | | | | | |
| | 0 | 664 | 45.1 | 664 | 45.1 |
| | 1 | 807 | 54.9 | 1,471 | 100.0 |
| PROFIT | | | | | |
| | 0 | 439 | 29.8 | 361 | 24.5 |
| | 1 | 1,032 | 70.2 | 1,471 | 100.0 |
| REIM | | | | | |
| | 0 | 162 | 11.0 | 162 | 11.0 |
| | 1 | 1,309 | 88.9 | 1,471 | 100.0 |
| METRO | | | | | |
| | 0 | 267 | 18.2 | 267 | 18.2 |
| | 1 | 1,204 | 81.8 | 1,471 | 100.0 |
| CON | | | | | |
| | 0 | 256 | 17.4 | 256 | 17.4 |
| | 1 | 1,215 | 82.6 | 1,471 | 100.0 |

[1] Please refer to Appendix B (p.208) for abbreviations of variables and their definitions

Table 10
Univariate Summary Statistics for Continuous Variables, 1993
(n = 1,471)

| Variables[1] | Mean | St. Dev. | Skewness | Kurtosis | W-Normal | Min. | Max. |
|---|---|---|---|---|---|---|---|
| PROSUB | 13.69 | 25.71 | 2.45 | 5.18 | 0.569* | 0 | 100 |
| RN | 1291.07 | 5735.73 | 15.53 | 258.03 | 0.136* | 0 | 8672 |
| LPN | 2049.57 | 6853.91 | 11.91 | 155.30 | 0.175* | 0 | 17943 |
| RN_LPN | 1.088 | 3.53 | 14.31 | 249.97 | 0.209* | 0 | 73.70 |
| MD | 30.81 | 482.81 | 26.61 | 728.85 | 0.049* | 0 | 11429 |
| DR | 70.10 | 1744.03 | 36.78 | 1383.89 | 0.038* | 0 | 10714 |
| PH | 19.06 | 63.59 | 7.78 | 83.32 | 0.316* | 0 | 1020.54 |
| OT | 113.21 | 895.55 | 19.88 | 468.76 | 0.107* | 0 | 12000 |
| PT | 105.91 | 466.99 | 17.18 | 345.37 | 0.183* | 0 | 10357.25 |
| ST | 75.85 | 722.79 | 22.24 | 559.94 | 0.088* | 0 | 11429 |
| DRUG | 38.77 | 338.12 | 27.32 | 885.75 | 0.108* | 0 | 2866 |
| SOCIAL | 300.30 | 1810.54 | 17.88 | 358.08 | 0.107* | 0 | 1631 |
| DIET | 80.22 | 547.49 | 20.32 | 434.53 | 0.107* | 0 | 694 |
| ANCILL | 419.29 | 1217.39 | 16.64 | 359.43 | 0.243* | 0 | 2963.89 |
| TOTBED | 138.97 | 97.61 | 3.30 | 20.68 | 0.775* | 8 | 1202 |
| OCC | 87.56 | 5.34 | -0.39 | -0.53 | 0.937* | 76.4 | 96.7 |
| OLD | 13.06 | 2.20 | 0.99 | 1.26 | 0.868* | 8.8 | 19 |

[1] Please refer to Appendix B (p.208) for abbreviations of variables and their definitions

* $p < 0.05$ level.

Table 11
Frequency Statistics for Ordinal Variables, 1993
(n= 1,471)

| Variables[1] | | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|---|---|---|---|---|---|
| HOSPBASE | | | | | |
| | 0 | 1,271 | 86.4 | 1,271 | 86.4 |
| | 1 | 200 | 13.6 | 1,471 | 100.0 |
| CHAIN | | | | | |
| | 0 | 639 | 43.4 | 639 | 43.4 |
| | 1 | 832 | 56.6 | 1,471 | 100.0 |
| PROFIT | | | | | |
| | 0 | 447 | 30.4 | 447 | 30.4 |
| | 1 | 1,024 | 69.6 | 1,471 | 100.0 |
| REIM | | | | | |
| | 0 | 162 | 7.2 | 162 | 11.0 |
| | 1 | 1,309 | 92.8 | 1,471 | 100.0 |
| METRO | | | | | |
| | 0 | 264 | 17.9 | 264 | 17.9 |
| | 1 | 1,207 | 82.1 | 1,471 | 100.0 |
| CON | | | | | |
| | 0 | 256 | 17.4 | 256 | 17.4 |
| | 1 | 1,215 | 82.6 | 1,471 | 100.0 |

[1] Please refer to Appendix B (p.208) for abbreviations of variables and their definitions

Table 12
Univariate Summary Statistics for Continuous Variables, 1994
(n = 1,471)

| Variables[1] | Mean | St. Dev. | Skewness | Kurtosis | W-Normal | Min. | Max. |
|---|---|---|---|---|---|---|---|
| PROSUB | 15.49 | 26.53 | 2.26 | 4.29 | 0.609* | 0 | 100 |
| RN | 1243.81 | 3467.99 | 12.11 | 172.61 | 0.238* | 0 | 11615.5 |
| LPN | 2018.27 | 6211.43 | 12.12 | 169.31 | 0.199* | 0 | 22477 |
| RN_LPN | 1.10 | 2.93 | 14.02 | 254.68 | 0.258* | 0 | 68.36 |
| MD | 25.64 | 405.05 | 31.69 | 1073.33 | 0.052* | 0 | 5714 |
| DR | 21.42 | 167.89 | 20.24 | 532.38 | 0.131* | 0 | 612.5 |
| PH | 22.07 | 117.87 | 21.89 | 632.10 | 0.179* | 0 | 3663.24 |
| OT | 90.97 | 444.61 | 24.10 | 724.94 | 0.177* | 0 | 5428.5 |
| PT | 136.26 | 637.55 | 15.82 | 290.55 | 0.172* | 0 | 8000 |
| ST | 59.87 | 407.91 | 29.85 | 1015.25 | 0.121* | 0 | 4000 |
| DRUG | 41.18 | 437.85 | 27.63 | 836.92 | 0.082* | 0 | 8000 |
| SOCIAL | 300.49 | 1694.43 | 18.39 | 396.64 | 0.115* | 0 | 1294 |
| DIET | 90.08 | 570.34 | 18.76 | 384.06 | 0.123* | 0 | 1153.25 |
| ANCILL | 523.95 | 2685.61 | 28.65 | 951.65 | 0.127* | 0 | 4011.11 |
| TOTBED | 139.69 | 96.99 | 3.34 | 21.19 | 0.773* | 8 | 1202 |
| OCC | 85.79 | 5.88 | -0.54 | -0.23 | 0.921* | 72.9 | 96.1 |
| OLD | 13.06 | 2.20 | 0.99 | 1.26 | 0.868* | 8.8 | 19 |

[1] Please refer to Appendix B (p.208) for abbreviations of variables and their definitions

* $p < 0.05$.

Table 13
Frequency Statistics for Ordinal Variables, 1994
(n = 1,471)

| Variables[1] | | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|---|---|---|---|---|---|
| HOSPBASE | | | | | |
| | 0 | 1,271 | 86.4 | 1,271 | 86.4 |
| | 1 | 200 | 13.6 | 1,471 | 100.0 |
| CHAIN | | 607 | 41.3 | 607 | 41.3 |
| | 0 | 864 | 58.7 | 1,471 | 100.0 |
| | 1 | | | | |
| PROFIT | | | | | |
| | 0 | 440 | 29.9 | 440 | 29.9 |
| | 1 | 1,031 | 70.1 | 1,471 | 100.0 |
| REIM | | | | | |
| | 0 | 162 | 11.0 | 162 | 11.0 |
| | 1 | 1,309 | 88.9 | 1,471 | 100.0 |
| METRO | | | | | |
| | 0 | 264 | 17.9 | 264 | 17.9 |
| | 1 | 1,207 | 82.1 | 1,471 | 100.0 |
| CON | | | | | |
| | 0 | 256 | 17.4 | 256 | 17.4 |
| | 1 | 1,215 | 82.6 | 1,471 | 100.0 |

[1] Please refer to Appendix B (p.208) for abbreviations of variables and their definitions

Table 14
Univariate Summary Statistics for Continuous Variables, 1995
(n = 1,471)

| Variables[1] | Mean | St. Dev. | Skewness | Kurtosis | W-Normal | Min. | Max. |
|---|---|---|---|---|---|---|---|
| PROSUB | 17.64 | 27.61 | 2.07 | 3.38 | 0.644* | 0 | 100 |
| RN | 1243.81 | 3467.99 | 12.11 | 172.61 | 0.238* | 0 | 11615.5 |
| LPN | 2018.27 | 6211.43 | 12.12 | 169.31 | 0.199* | 0 | 22477 |
| RN_LPN | 1.10 | 2.93 | 14.02 | 254.68 | 0.258* | 0 | 68.36 |
| MD | 25.64 | 405.04 | 31.69 | 1073.33 | 0.052* | 0 | 5714 |
| DR | 21.42 | 167.89 | 20.24 | 532.38 | 0.131* | 0 | 612.5 |
| PH | 22.07 | 117.87 | 21.89 | 632.10 | 0.179* | 0 | 3663.24 |
| OT | 90.97 | 444.61 | 24.10 | 724.94 | 0.177* | 0 | 5428.5 |
| PT | 136.26 | 637.55 | 15.82 | 290.55 | 0.172* | 0 | 8000 |
| ST | 59.87 | 407.91 | 29.85 | 1015.25 | 0.121* | 0 | 4000 |
| DRUG | 41.18 | 437.85 | 27.63 | 836.92 | 0.082* | 0 | 8000 |
| SOCIAL | 300.49 | 1694.43 | 18.39 | 396.64 | 0.115* | 0 | 1294 |
| DIET | 90.08 | 570.34 | 18.76 | 384.06 | 0.123* | 0 | 1153.25 |
| ANCILL | 514.34 | 2643.98 | 29.72 | 1010.78 | 0.124* | 0 | 3642.5 |
| TOTBED | 139.79 | 96.58 | 3.37 | 21.53 | 0.772* | 8 | 1202 |
| OCC | 85.96 | 6.23 | -0.50 | -0.44 | 0.924* | 72.4 | 97 |
| OLD | 13.06 | 2.20 | 0.99 | 1.26 | 0.868* | 8.8 | 19 |

[1] Please refer to Appendix B (p.208) for abbreviations of variables and their definitions
* $p < 0.05$.

Table 15
Frequency Statistics for Ordinal Variables, 1995
(n = 1,471)

| Variables[1] | | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|---|---|---|---|---|---|
| HOSPBASE | | | | | |
| | 0 | 1,271 | 86.4 | 1,271 | 86.4 |
| | 1 | 200 | 13.6 | 1,471 | 100.0 |
| CHAIN | | | | | |
| | 0 | 577 | 39.2 | 577 | 39.2 |
| | 1 | 894 | 60.8 | 1,471 | 100.0 |
| PROFIT | | | | | |
| | 0 | 435 | 29.6 | 435 | 29.6 |
| | 1 | 1,036 | 70.4 | 1,471 | 100.0 |
| REIM | | | | | |
| | 0 | 162 | 11.0 | 162 | 11.0 |
| | 1 | 1,309 | 88.9 | 1,471 | 100.0 |
| METRO | | | | | |
| | 0 | 264 | 17.9 | 264 | 17.9 |
| | 1 | 1,207 | 82.1 | 1,471 | 100.0 |
| CON | | | | | |
| | 0 | 256 | 17.4 | 256 | 17.4 |
| | 1 | 1,215 | 82.6 | 1,471 | 100.0 |

[1] Please refer to Appendix B (p.208) for abbreviations of variables and their definitions

except for the elderly population (OLD) variable, the correlations between percentage of subacute care beds (PROSUB) and other continuous variables are positive and significant at the 0.05 level. This finding could be interpreted as more subacute care beds in a facility are associated with more professional staff. The percentage of physicians per 100 beds (PH) has a positive and significant association with the variables, SNF types (HOSPBASE), ancillary staff (ANCILL), metropolitan (METRO), and occupancy rate (OCC) (Appendix C). The correlations between percentage of subacute care beds (PROSUB) and ownership (PROFIT), and chain affiliated (CHAIN) show negative relationships. The ANCILL variable has similar positive and significant associations with the PH variable. There are negative associations among chain affiliated (CHAIN) and SNF type (HOSPBASE) with Medicaid reimbursement (REIM). SNF type (HOSPBASE) is significantly associated with ownership (PROFIT) in a negative direction. Occupancy rate (OCC) is positively associated with PROSUB, OLD, REIM, METRO, and CON. Also, OCC is negatively and significantly associated with CHAIN and PROFIT (Appendix C). The correlation matrix for each year has similar results (Appendix D, E, F, and G).

## Autocorrelation and Multicollinearity

The Durbin-Watson D statistic is 1.118, and first order autocorrelation is 0.441, indicating positive autocorrelation, and that the errors are not independent. Multicollinearity is probably not a serious problem for this estimation, according to the following results: 1) None of the correlation coefficients is as large as $r = 0.80$; 2) All the

condition indexes are smaller than 30; 3) Variation inflation values are less than 3; and 4) Tolerance level is close to 1.00.

## Trend Analysis

### SNF Type

Figure 10 shows several remarkable trends in nursing home subacute care services in the United States. For all nursing homes in the sample, the average percentage of subacute care beds grew from 12.44 percent in 1992 to 17.64 percent in 1995. The rates of growth were, respectively, 10 percent, 13 percent, and 14 percent, for 1992-1993, 1993-1994, and 1994-1995 (Figure 11). In hospital-based nursing homes, the average percentage of subacute care beds increased from 19.15 percent in 1992 to 24.68 percent in 1994, but fell to 22.92 percent in 1995 (Figure 10). The growth rates were, respectively, 18 percent for 1992-1993, 9 percent for 1993-1994 (Figure 11). However, there was no increase (-7 %) in subacute care beds in 1995 as compared to 1994. Positive change also can be observed in the freestanding nursing homes. The average percentage of subacute care beds in freestanding nursing homes grew from 11.39 percent in 1992 to 16.81 percent in 1995 (Figure 10). For 1993, 1994, and 1995, respectively, the average rates of change were 8 percent, 14 percent, and 20 percent for 1993, 1994, and 1995 (Figure 11).

Figure 10. Growth of Subacute Care Beds in Nursing Facilities,
by SNF type
1992-1995

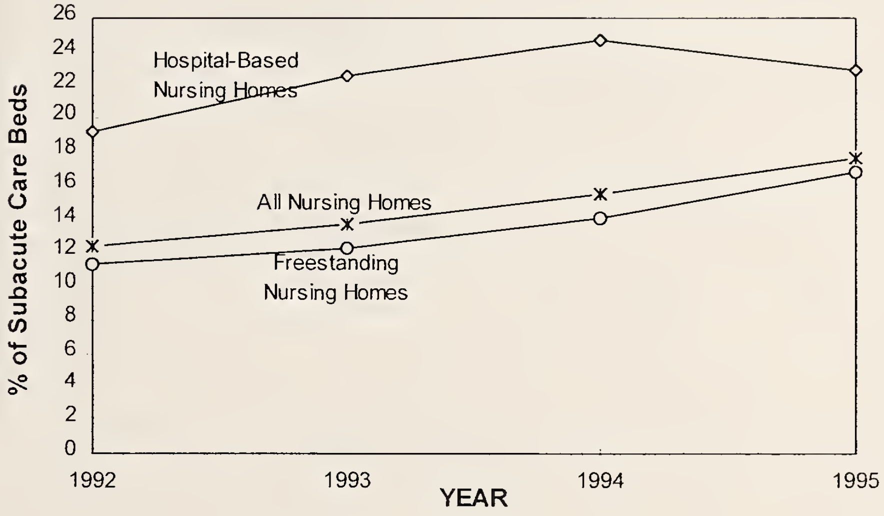
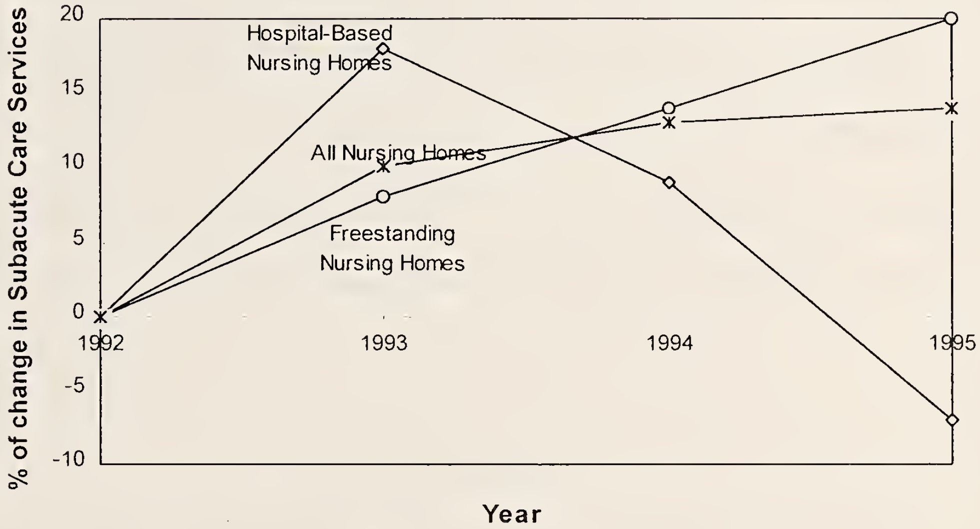


Figure 11. Rate of Change in Subacute Care Beds in Nursing Facilities, by SNF type
1992-1995



## Ownership Trend

Figures 12 and 13 show the trend in subacute care beds by different ownerships. The percentage of subacute care in FP nursing facilities constantly increased, from 11.06 percent in 1992 to 16.71 percent in 1995 (Figure 12). NFP nursing facilities increased in percentage of subacute care beds from 15.69 percent in 1992 to 19.86 percent in 1995 (Figure 12). In NFP nursing homes, the rates of change for subacute care beds were 12.33 percent in 1993, 8.25 percent in 1994, and 4.11 percent in 1995, comparing levels to those of the respective previous year (Figure 13). For FP nursing homes, the rate of change in subacute care services increased from 8.26 percent in 1992-1993 to 19.73 percent in 1994-1995.

## CON/Moratoria

In the states without CON/moratoria regulations, the average percentage of subacute care beds increased from 14 percent in 1992 to 21 percent in 1995 (Figure 14). The rates of change were, respectively, 7 percent, 31 percent, and 6 percent, for 1992-1993, 1993-1994, and 1994-1995 (Figure 15). In states with either CON or moratoria regulation, the average percentage of subacute care beds grew from 12 percent in 1992 to 17 percent in 1995 (Figure 14). The rate of change for SNFs with CON/moratoria regulations fell from 11 percent in 1992-1993 to 9 percent in 1993-1994, but increased 16 percent in 1994-1995 (Figure 15).

Figure 12. Growth of Subacute Care Beds in Nursing Facilities, by Ownership 1992-1995

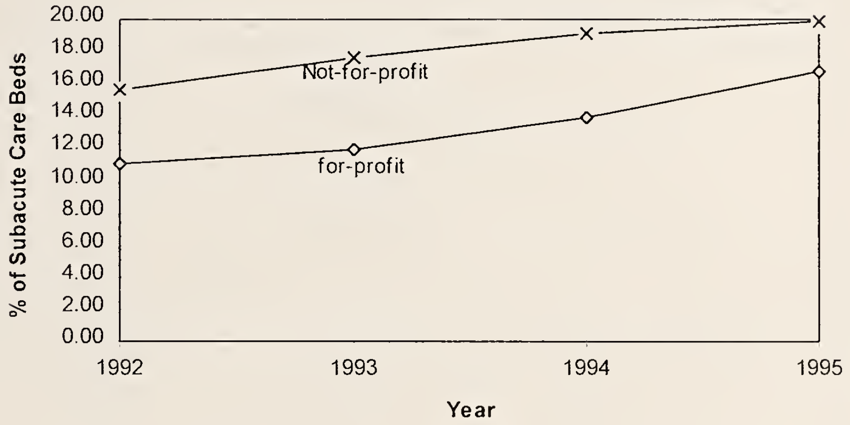


Figure 13. Rate of Change in Subacute Care Beds in Nursing Facilities, by Ownership
1992-1995

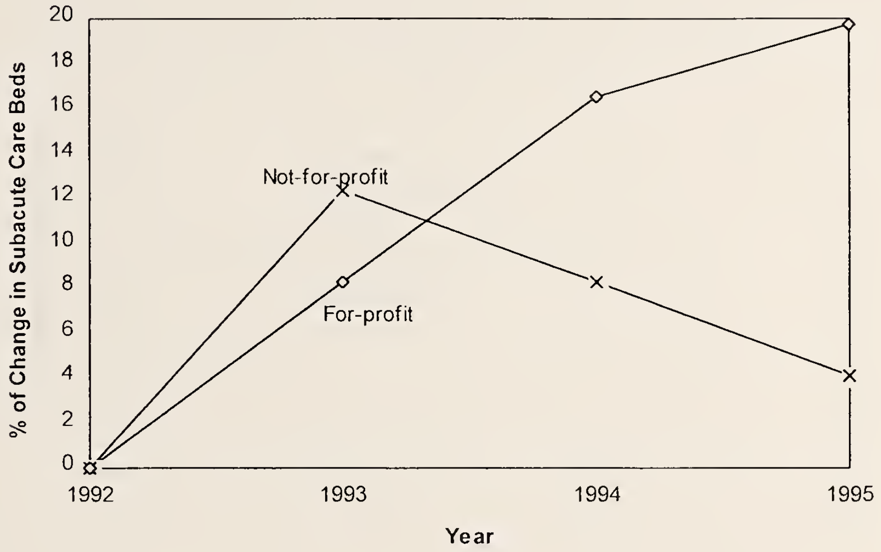


Figure 14. Growth of Subacute Care Beds in Nursing Facilities, by CON/moratoria 1992-1995

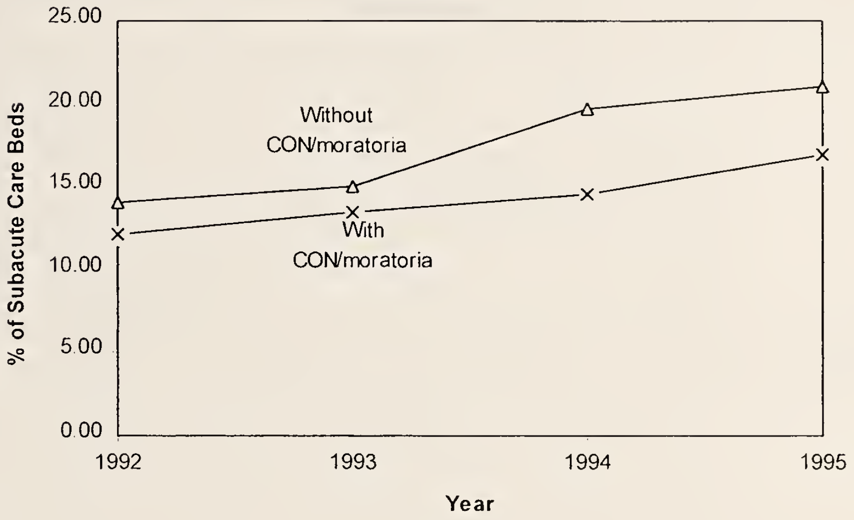
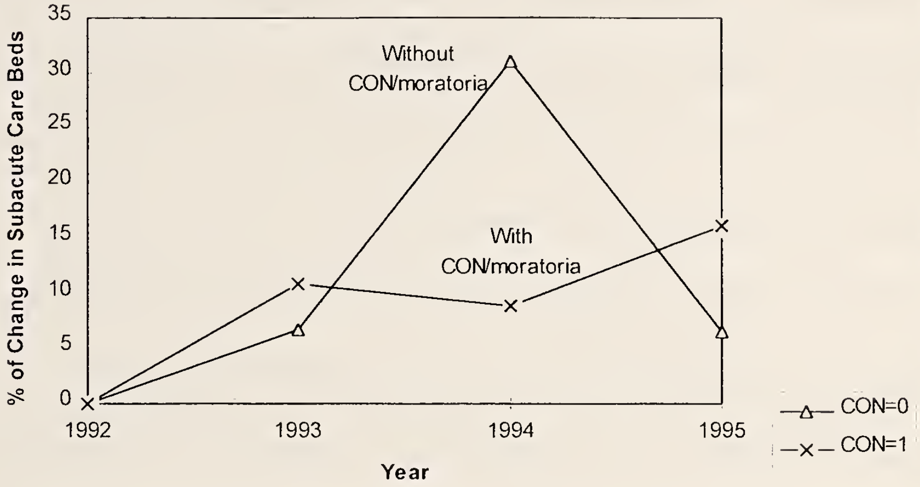


Figure 15. Rate of Change in Subacute Care Beds in Nursing Facilities,
by CON/moratoria
1992-1995



## Reimbursement

As Figure 16 shows, the percentage of subacute care beds steadily increased no matter which program of reimbursement the nursing homes utilize. For instance, in nursing homes participating only in Medicaid, the average percentage of subacute care beds increased from 17.68 percent in 1992 to 32.16 percent in 1995. However, the growth rate was slower after 1993: with 31 percent in 1993 comparing to1992, 25 percent in 1994 comparing to 1993, and 10 percent in 1995 comparing to 1994 (Figure 17). Figure 17 also shows a greater downward slope for both Medicaid and other programs. SNFs participating only in Medicare show rates of change of 31 percent in 1992-1993, 25 percent in 1993-1994, and 10 percent in 1994-1995. Participating in other programs show increases in the percentage of subacute care beds, from 11 percent, to 15 percent, 17 percent, to 18 percent for 1992, 1993, 1994, and 1995, respectively (Figure 16).

## Chain Affiliation

Figure 18 compares the growth of subacute care beds for chain and for non-chain affiliations; their percentage of subacute care beds grew over the four-year period, from 11.13 percent in 1992 to 15.93 percent in 1995 for chain-affiliated SNFs. As shown in Figure 19, the rates of change in subacute care beds for chain-affiliated SNFs were, respectively, 6 percent, 14 percent, and 13 percent, for years 1992-1993, 1993-1994, and 1994-1995. In non-chain-affiliated SNFs, the rate of change increased by 16 percent to

Figure 16. Growth of Subacute Care Beds in Nursing Facilities, by Program Participation 1992-1995

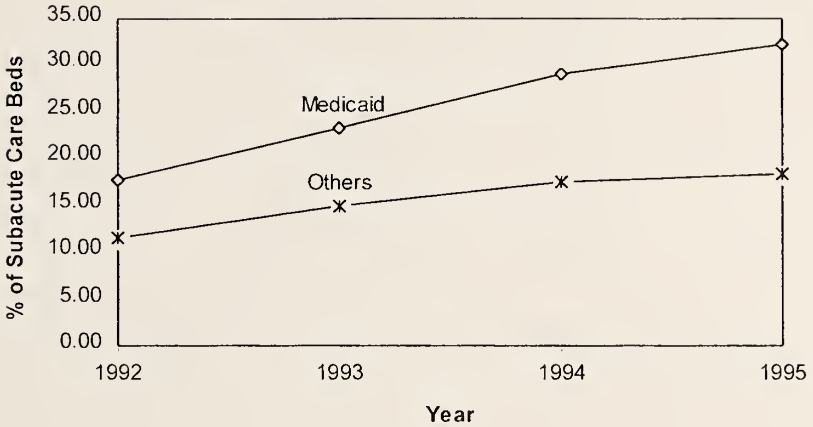
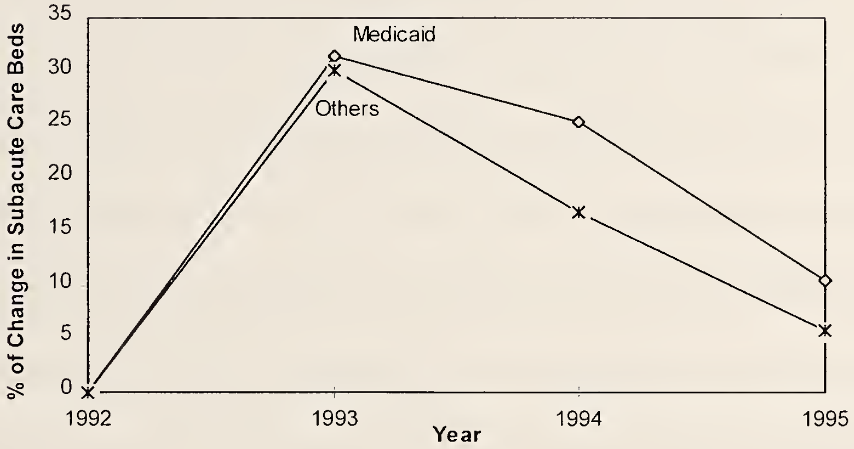


Figure 17. Rate of Change in Subacute Care Beds in Nursing Facilities,
by Program Participation
1992-1995



reach an average percentage of 15.38 percent subacute care beds in 1993 over 1992, followed by 13 percent and 17 percent, for 1993-1994 and 1994-1995 (Figure 19).

### Metropolitan Area

In both nursing homes in metropolitan areas and those in non-metropolitan areas, the percentage of subacute care beds increased constantly over these four years. Figure 20 presents the growth trend. SNFs located in metropolitan areas showed a higher percentage of subacute care beds, increasing their average percentage of subacute care from 13.03 percent in 1992 to 18.51 percent in 1995. The percentage of subacute care beds in non-metropolitan nursing homes increased only from 9.81 percent in 1992 to 13.74 percent in 1995 (Figure 20). However, the slope of the change was greater in non-metropolitan areas, showing that the growth rate in the 1994-1995 year is faster in non-metropolitan nursing facilities (Figure 21).

Figure 18. Growth of Subacute Care Beds in Nursing Facilities, by Chain Affiliation
1992-1995

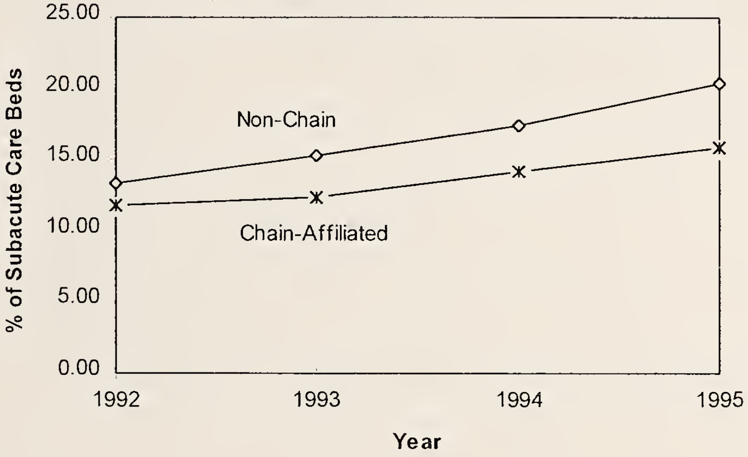


Figure 19. Rate of Change in Subacute Care Beds in Nursing Facilities,
by Chain Affiliation
1992-1995

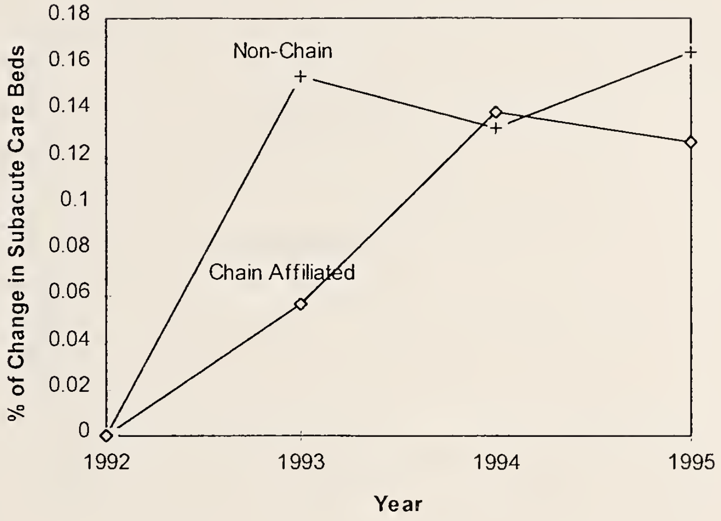


Figure 20. Growth of Subacute Care Beds in Nursing Facilities,
by Metropolitan Areas
1992-1995

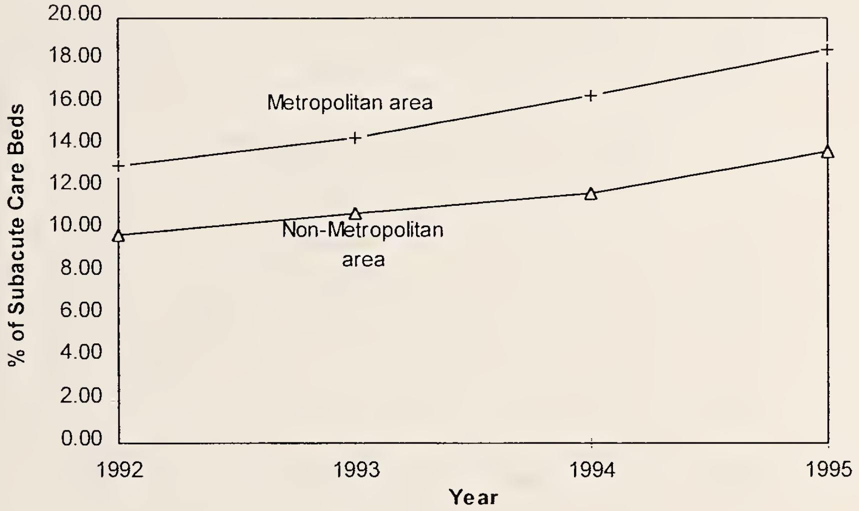
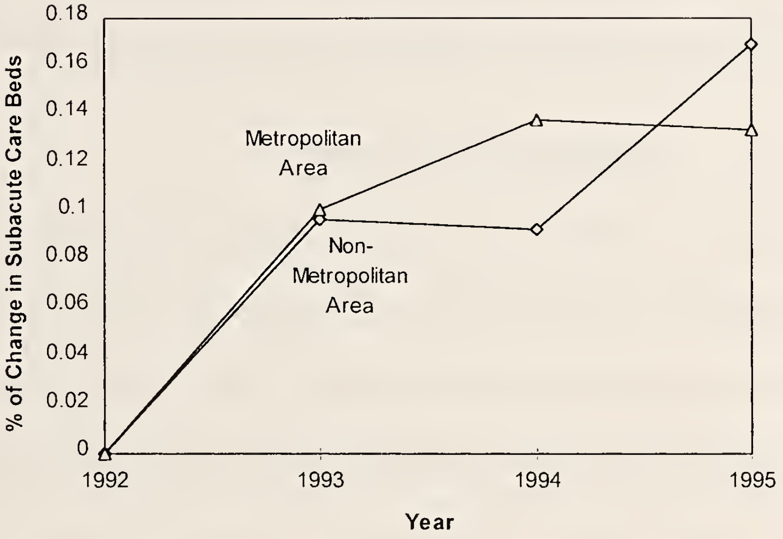


Figure 21. Rate of Change in Subacute Care Beds in Nursing Facilities, by Metropolitan Area
1992-1995



## Time Series Cross-Section Regression Analysis

Tables 16 and 19 present the estimation results for a common time-series cross-sectional regression with a dummy variable for SNF type. Tables 17, 18, 20, and 21 summarize the results for separate time-series cross-sectional regressions by SNF types.

### Variance Components Model

The time series cross section regression (TSCSREG) model depicts the relationships between chain affiliation, SNF type, Medicaid reimbursement, ownership, metropolitan, CON/Moratoria, RN/LPN ratio, ancillary staff, physicians, occupancy rate, aging population, and percentage of subacute care beds. These results support a resource dependency model as outlined in the hypotheses of chapter three.

The TSCSREG results using Fuller and Battese, and DaSilva Estimations are shown in Tables 16, 17, and 18. As seen in Table 16, the percentage of subacute care beds is strongly associated with several variables, including SNF type, Medicaid reimbursement, ownership, metropolitan area, RN/LPN, physicians, ancillary staff, occupancy rate, and time. There is a statistically positive association between the percentage of subacute care beds and nursing homes' locations (Hypothesis One). Generally, nursing homes in metropolitan areas have higher percentage of subacute care beds than are those in non-metropolitan areas. Table 16 also shows that the percentage of subacute care beds has a statistically significant and positive relationship with SNF type (Hypothesis Six). That is, hospital-based nursing facilities have higher percentages of subacute care beds than freestanding nursing facilities.

Findings from the full model indicate that SNFs participating only in Medicaid have higher percentages of subacute care beds (Hypothesis Four). There is a negative relationship between the percentage of subacute care beds and ownership illustrated in Table 16; in other words, NFP nursing homes are likely to provide more subacute care beds (Hypothesis Five). All staffing variables, including the ratio of RNs over LPNs, number of physicians per 100 beds, and logarithm of ancillary staff per 100 beds, show statistically significant and positive association with the percentages of subacute care beds (Hypotheses Seven, Eight, and Nine). The results also show a positive association between chain affiliation and the percentage of subacute care beds, but it is not significant (Hypothesis Three). Percentage of subacute care beds and CON/moratoria do not have a statistically significant relationship (Hypothesis Two). The state occupancy rate of nursing homes is a factor influencing subacute care services, with a positive and significant association. Percentage of population over 65 years old or older does not show a significant association with percentage of subacute care beds. The time variable is strongly associated with percentage of subacute care beds; that is, the percentage of subacute care beds increased by the following year.

The overall model R-square by Fuller and Battese is 4.81 percent, and the root MSE is 18.62. The DaSilva Method has results similar to Fuller and Batteses' estimate,

Table 16
Summary of Time Series Cross-Section Regression Models for 1992-1995,
All Nursing Facilities (n = 5,884)

| | Fuller-Battese Method | | Da Silva Method | |
|---|---|---|---|---|
| | Beta (± SE) | t statistic | Beta (± SE) | t statistic |
| % Subacute Care Beds (Intercept) | -20.13 (7.92) | -2.54** | -22.12 (7.87) | -2.81*** |
| Chain Affiliated | -0.04 (0.88) | 0.05 | 0.39 (0.85) | 0.46 |
| SNF Type | 3.66 (1.58) | 2.31** | 4.28 (1.59) | 2.68*** |
| Medicaid Reimbursement | -7.32 (0.79) | -9.22*** | -7.16 (0.80) | -8.95*** |
| Ownership | -2.49 (0.95) | -2.62*** | -1.40 (0.93) | -1.51 |
| Metropolitan Area | 2.81 (1.32) | 2.12** | 3.06 (1.33) | 2.30** |
| CON/Moratorium | -0.92 (0.84) | -1.11 | -0.92 (0.85) | -1.09 |
| RN/LPN | 0.30 (0.10) | 3.01*** | 0.26 (0.09) | 2.93*** |
| Physicians | 0.012 (0.003) | 3.48*** | 0.02 (0.003) | 4.79*** |
| Log of Ancillary Staff | 2.63 (0.32) | 8.09*** | 2.35 (0.31) | 7.56*** |
| Occupancy Rate | 0.33 (0.09) | 3.73*** | 0.35 (0.09) | 3.99*** |
| Aging Population (>65yrs) | 0.01 (0.24) | 0.05 | 0.01 (0.24) | 0.04 |
| Time | 1.76 (0.23) | 7.68*** | 1.74 (0.21) | 8.37*** |
| Model Description | | | | |
| Number of Cross Sections | | 1471 | | 1471 |
| Number of Time Series | | 4 | | 4 |
| Order of Moving Average Error Process | | NA | | 1 |
| Variance Component Estimates | | | | |
| Degrees of Freedom | | 5871 | | 5871 |
| SSE | | 2037674 | | 7027.82 |
| MSE | | 347.07 | | 1.19 |
| Root MSE | | 18.62 | | 1.09 |
| R-square | | 0.0481 | | 0.0416 |
| Variance Component for Cross Sections | | 282.57 | | 202.84 |
| Variance Component for Time Series | | 0.000 | | 0.000 |
| Variance Component for Errors | | 344.76 | | NA |

* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

with the exception of the ownership variable. The R-square from the DaSilva method is 4.16 percent, and the root MSE is 1.09.

Table 17 presents results for the hospital-based nursing facility model. Six independent variables are statistically significant. Chain affiliation is positively associated with higher percentage of subacute care beds. Nursing homes located in states with CON/moratoria policy have lower percentages of subacute care beds. The ratio of RNs to LPNs is a significant indicator of higher percentage of subacute care beds: the higher the ratio of RNs to LPNs, the more subacute care beds in a facility. Facilities with higher physicians per 100 beds are associated with more subacute care beds. The logarithm of ancillary staff per 100 beds has a positive relationship with the percentage of subacute care beds. Facilities located in a state with higher occupancy rates are also positively associated with higher percentages of subacute care beds. These relationships support the argument that subacute care services respond to the needs for different resources. The time variable shows a positive relationship with subacute care beds, but it is not significant in this model. The R-square from the Fuller and Battese estimation is 7.23 percent, and root MSE is 25.56. For the DaSilva method, the R-square is 6.37 percent and root MSE is 1.05. Other independent variables in the hospital-based SNF model are not statistically significant.

Table 18 summarizes the results for the freestanding SNF model. Medicaid reimbursement is a significant factor for the growth of subacute care beds. A particularly strong effect also is observed for metropolitan location. SNFs in metropolitan areas are associated with higher percentages of subacute care beds. NFP nursing facilities have a higher percentage of subacute care beds. A higher percentage of subacute care beds

Table 17
Summary of Time Series Cross-Section Regression Models for 1992-1995, Hospital-Based Nursing Facilities
(n = 800)

| | Fuller-Battese Method | | Da Silva Method | |
|---|---|---|---|---|
| | Beta (± SE) | t statistic | Beta (± SE) | t statistic |
| % Subacute Care Beds (Intercept) | -67.58 (27.57) | -2.45** | -65.54 (27.50) | -2.38** |
| Chain Affiliated | 7.03 (2.94) | 2.39** | 6.91 (2.94) | 2.35** |
| Medicaid Reimbursement | -0.81 (3.28) | -0.25 | -1.17 (3.28) | -0.36 |
| Ownership | -2.67 (2.04) | -1.31 | -1.09 (2.01) | -0.55 |
| Metropolitan Area | 3.16 (4.10) | 0.77 | 3.50 (4.14) | 0.85 |
| CON/Moratorium | -5.90 (2.86) | -2.06** | -5.86 (2.89) | -2.03** |
| RN/LPN | 0.64 (0.22) | 2.92*** | 0.55 (0.20) | 2.68*** |
| Physicians | 0.05 (0.01) | 4.14*** | 0.05 (0.01) | 4.38*** |
| Log of Ancillary Staff | 3.89 (1.25) | 3.11*** | 3.44 (1.23) | 2.80*** |
| Occupancy Rate | 0.73 (0.30) | 2.42** | 0.74 (0.30) | 2.44*** |
| Aging Population (>65yrs) | -0.23 (0.86) | -0.27 | -0.23 (0.87) | -0.27 |
| Time | 1.54 (0.99) | 1.56 | 1.48 (0.94) | 1.57 |
| Model Description | | | | |
| Number of Cross Sections | | 200 | | 200 |
| Number of Time Series | | 4 | | 4 |
| Order of Moving Average Error Process | | NA | | 1 |
| Variance Component Estimates | | | | |
| Degrees of Freedom | | 788 | | 788 |
| SSE | | 514987.3 | | 864.34 |
| MSE | | 653.54 | | 1.09 |
| Root MSE | | 25.56 | | 1.05 |
| R-Square | | 0.0723 | | 0.0637 |
| Variance Component for Cross Sections | | 377.74 | | 249.65 |
| Variance Component for Time Series | | 1.39 | | 1.02 |
| Variance Component for Errors | | 649.22 | | NA |

* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

Table 18
Summary of Time Series Cross-Section Regression Models for 1992-1995, Freestanding Nursing Facilities
(n = 5,084)

| | Fuller-Battese Method | | Da Silva Method | |
|---|---|---|---|---|
| | Beta (± SE) | t statistic | Beta (± SE) | t statistic |
| % Subacute Care Beds (Intercept) | -12.64 (8.20) | -1.54 | -14.29 (8.23) | -1.74* |
| Chain Affiliated | -1.31 (0.90) | -1.45 | -0.55 (0.86) | -0.64 |
| Medicaid Reimbursement | -8.08 (0.80) | -10.11*** | -7.86 (0.81) | -9.76*** |
| Ownership | -2.72 (1.12) | -2.44*** | -2.75 (1.10) | -2.51** |
| Metropolitan Area | 3.05 (1.38) | 2.21** | 3.21 (1.38) | 2.33** |
| CON/Moratorium | 0.03 (0.86) | 0.03 | 0.03 (0.87) | 0.03 |
| RN/LPN | 0.11 (0.12) | 0.96 | 0.12 (0.11) | 1.16 |
| Physicians | 0.005 (0.004) | 1.31 | 0.01 (0.004) | 2.67*** |
| Log of Ancillary Staff | 2.57 (0.33) | 7.88*** | 2.25 (0.31) | 7.32*** |
| Occupancy Rate | 0.25 (0.09) | 2.77*** | 0.28 (0.09) | 3.07*** |
| Aging Population (>65yrs) | 0.07 (0.24) | 0.28 | 0.06 (0.24) | 0.25 |
| Time | 1.78 (0.34) | 5.23*** | 1.81 (0.38) | 4.82*** |
| Model Description | | | | |
| Number of Cross Sections | | 1271 | | 1271 |
| Number of Time Series | | 4 | | 4 |
| Order of Moving Average Error Process | | NA | | 1 |
| Variance Component Estimates | | | | |
| Degrees of Freedom | | 5072 | | 5072 |
| SSE | | 1507160 | | 6322.02 |
| MSE | | 297.15 | | 1.25 |
| Root MSE | | 17.24 | | 1.12 |
| R-Square | | 0.0396 | | 0.0305 |
| Variance Component for Cross Sections | | 260.23 | | 187.40 |
| Variance Component for Time Series | | 0.31 | | 0.45 |
| Variance Component for Errors | | 294.93 | | NA |

* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

also is associated with higher logarithm of ancillary staff per 100 beds. The number of physicians per 100 beds is a significant indicator in the DaSilva estimation, but not in the Fuller-Battese Method. SNFs located in states with higher occupancy rates are associated with more subacute care beds. Time is significantly positively associated with the percentage of subacute care beds. The R-squares are, respectively, 3.96 percent and 3.05 percent, and root MSEs are, respectively, 17.22 and 1.12, for the Fuller-Battese and DaSilva methods.

## Seemingly Unrelated Regression Model

The SUR model is a generalization of OLS for multi-equation systems. The SUR model uses the correlations among the errors in different equations to improve the regression estimates, but still assumes that all the regressors are independent variables. Tables 19 to 21 give the results for the full model, the hospital-based SNF model, and the freestanding SNF model, using SUR estimation.

Table 19 presents the results of all nursing homes by each year. The results are similar to those from the variance components models. The SUR model has a system-weighted R-square around 5.4 percent, and the system weighted MSE is 0.9956. SNF type is significantly associated with the percentage of subacute care beds in 1993 and 1994, but not in 1992 and 1995. NFP nursing facilities have higher percentages of subacute care beds over the first three years, the exception being 1995. Table 19 also shows that Medicaid reimbursement has a significant association with a higher percentage of subacute care beds over the four years. SNFs located in metropolitan have higher percentages of subacute care beds in 1994 and 1995. SNFs in states with active

Table 19
Seemingly Unrelated Regression Estimation for 1992-1995,
All Nursing Facilities
(n = 1,471)

| | 1992 | | 1993 | | 1994 | | 1995 | |
|---|---|---|---|---|---|---|---|---|
| | Beta$^a$ (± SE) | t | Beta$^a$ (± SE) | t | Beta$^a$ (± SE) | t | Beta$^a$ (± SE) | t |
| % Subacute Care Services | 0 | -1.59 | 0 | -1.58 | 0 | -0.21 | 0 | -1.91** |
| (Intercept) | (11.08) | | (10.69) | | (10.17) | | (10.39) | |
| Chain Affiliated | 0.005 | 0.22 | 0.0001 | 0.009 | -0.0003 | -0.02 | -0.02 | -1.01 |
| | (1.23) | | (1.18) | | (1.23) | | (1.36) | |
| SNF type | 0.02 | 0.71 | 0.06 | 2.30** | 0.06 | 2.38** | 0.02 | 0.89 |
| | (2.01) | | (2.02) | | (2.08) | | (2.21) | |
| Medicaid Reimbursement | -0.10 | -3.66*** | -0.17 | -6.51*** | -0.23 | -8.90*** | -0.24 | -8.96*** |
| | (1.00) | | (1.003) | | (1.04) | | (1.12) | |
| Ownership | -0.06 | -2.59*** | -0.05 | -1.94** | -0.05 | -2.08** | -0.02 | -0.89 |
| | (1.23) | | (1.21) | | (1.27) | | (1.37) | |
| Metropolitan Area | 0.02 | 0.82 | 0.04 | 1.59 | 0.05 | 2.06** | 0.06 | 2.35** |
| | (1.66) | | (1.68) | | (1.73) | | (1.84) | |
| CON/Moratoria | -0.007 | -0.27 | 0.003 | 0.13 | -0.05 | -1.82* | -0.03 | -0.97 |
| | (1.05) | | (1.06) | | (1.09) | | (1.14) | |
| RN/LPN | 0.08 | 3.88*** | 0.04 | 1.89** | 0.002 | 0.11 | -0.01 | -0.48 |
| | (0.14) | | (0.14) | | (0.19) | | (0.22) | |
| Physicians | 0.11 | 4.63*** | 0.09 | 4.38*** | 0.09 | 4.12*** | 0.02 | 0.68 |
| | (0.01) | | (0.008) | | (0.005) | | (0.005) | |
| Log of Ancillary Staff | 0.15 | 6.17*** | 0.11 | 4.93*** | 0.13 | 5.54*** | 0.12 | 4.35*** |
| | (0.48) | | (0.48) | | (0.52) | | (0.60) | |
| Occupancy Rate | 0.04 | 1.50 | 0.07 | 2.84*** | 0.04 | 1.71* | 0.10 | 4.02*** |
| | (0.13) | | (0.13) | | (0.11) | | (0.12) | |
| Aging Population (>65yrs) | 0.03 | 1.06 | -0.03 | -1.03 | 0.009 | 0.35 | 0.0001 | 0.005 |
| | (0.30) | | (0.30) | | (0.31) | | (0.33) | |
| Durbin-Watson | | 1.903 | | 1.844 | | 1.861 | | 1.874 |
| First Order Autocorrelation | | 0.048 | | 0.078 | | 0.069 | | 0.063 |
| Degrees of Freedom | 5836 | | | | | | | |
| System weighted MSE | 0.9956 | | | | | | | |
| System weighted R-Square | 0.054 | | | | | | | |

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[a] standardized coefficient
* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

CON/moratoria have lower percentage of subacute care beds, particularly in 1994. Higher numbers of physicians per 100 beds are positively related to higher percentages of subacute care beds in 1992, 1993, and 1994. Table 19 also indicates a positive relationship between the ratio of RNs to LPNs and the percentage of subacute care beds in 1992 and 1993. Significant and positive relationships are found between the logarithm of ancillary staff and the percentage of subacute care beds over the four-year period. Occupancy rate is another factor associated with the growth of subacute care services for the last three of the four years. Neither chain affiliation nor elderly population is significantly associated with the percentage of subacute care beds. The Durbin-Watson statistics for each year also can be found in Table 19; 0.048 for 1992, 0.078 for 1993, 0.069 for 1994, and 0.063 for 1995. There is a positive autocorrelation in each year.

The results of the SUR models are presented for hospital-based nursing homes in Table 20. The system weighted R-square is 10.86 percent, and the system weighted MSE is 0.99164. NFP nursing homes are associated with higher percentages of subacute care beds in 1992. SNFs located in states without active CON or Moratoria are likely to have higher percentages of subacute care beds in 1992 and 1994. Higher ratios of RNs to LPNs are associated with a higher percentage of subacute care beds in 1992. The number of physicians per 100 beds is strongly associated with the percentage of subacute care beds, in each year: facilities with more physicians have higher percentage of subacute care beds. The logarithm of ancillary staff per 100 beds is statistically significantly and positively associated with the percentages of subacute care beds in 1992, 1993, and 1994.

Table 20
Seemingly Unrelated Regression Estimation for 1992-1995,
Hospital-Based Nursing Facilities
(n = 200)

| | 1992 | | 1993 | | 1994 | | 1995 | |
|---|---|---|---|---|---|---|---|---|
| | Beta[a] (± SE) | t | Beta[a] (± SE) | t | Beta[a] (± SE) | t | Beta[a] (± SE) | t |
| % Subacute Care Services | 0 | -1.72* | 0 | -1.78* | 0 | -1.19 | 0 | -1.52 |
| (Intercept) | (40.93) | | (41.52) | | (39.62) | | (37.80) | |
| Chain Affiliated | 0.05 | 0.77 | 0.09 | 1.35 | 0.10 | 1.61 | 0.10 | 1.48 |
| | (4.55) | | (4.61) | | (4.49) | | (4.47) | |
| Medicaid Reimbursement | 0.10 | 1.43 | 0.006 | 0.09 | -0.08 | -1.10 | -0.11 | -1.44 |
| | (4.39) | | (4.74) | | (4.73) | | (4.69) | |
| Ownership | -0.12 | -1.79* | -0.06 | -0.83 | 0.02 | 0.30 | -0.04 | -0.57 |
| | (2.81) | | (3.03) | | (3.04) | | (2.97) | |
| Metropolitan Area | 0.04 | 0.57 | 0.06 | 0.85 | 0.04 | 0.50 | 0.05 | 0.64 |
| | (5.39) | | (5.82) | | (5.75) | | (5.68) | |
| CON/Moratoria | -0.12 | -1.67* | -0.09 | -1.24 | -0.15 | -2.02** | -0.09 | -1.16 |
| | (3.74) | | (4.08) | | (4.03) | | (3.94) | |
| RN/LPN | 0.20 | 3.20*** | 0.06 | 0.94 | 0.06 | 0.90 | -0.05 | -0.71 |
| | (0.25) | | (0.60) | | (0.62) | | (0.62) | |
| Physicians | 0.17 | 2.47** | 0.14 | 2.25** | 0.17 | 2.82*** | 0.23 | 3.43*** |
| | (0.02) | | (0.02) | | (0.02) | | (0.02) | |
| Log of Ancillary Staff | 0.13 | 1.94** | 0.12 | 1.83* | 0.16 | 2.53** | 0.06 | 0.90 |
| | (1.89) | | (2.09) | | (2.08) | | (2.24) | |
| Occupancy Rate | 0.12 | 1.58 | 0.17 | 2.17** | 0.05 | 0.63 | 0.19 | 2.48** |
| | (0.47) | | (0.48) | | (0.43) | | (0.39) | |
| Aging Population (>65yrs) | -0.04 | -0.55 | -0.11 | -1.48 | 0.11 | 1.51 | -0.04 | -0.60 |
| | (1.15) | | (1.24) | | (1.19) | | (1.16) | |
| Durbin-Watson | | 2.054 | | 2.156 | | 1.874 | | 1.896 |
| First Order Autocorrelation | | -0.027 | | -0.080 | | 0.059 | | 0.050 |
| Degrees of Freedom | | 756 | | | | | | |
| System weighted MSE | | 0.99164 | | | | | | |
| System weighted R-Square | | 0.1086 | | | | | | |

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[a] standardized coefficient
* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

Occupancy rate has a significant and positive relationship with the percentage of subacute care beds in 1993 and in 1995 for hospital-based SNFs. However, whether the hospital-based facility is located in a metropolitan area is not statistically significantly associated with the percentage of subacute care beds over the four-year period. Neither Medicaid reimbursement nor chain affiliation is a significant determinant of the percentage of subacute care beds in hospital-based SNFs.

Table 21 summarizes the results of the SUR model for freestanding nursing homes. The system weighted R-square is 5.12 percent, and the system weighted MSE is 0.99455. Seven variables show significant associations with the percentage of subacute care beds. Being owned by a multi-facility system has a negative relationship with the percentage of subacute care beds, but it is significant only for 1995. Freestanding nursing facilities in metropolitan areas have had higher percentages of subacute care beds than did those in non-metropolitan areas, in 1994 and 1995. Medicaid reimbursement is an important indicator for the percentage of subacute care beds in freestanding nursing facilities for the four-year period; nursing facilities that participate only in Medicaid are associated with higher percentage of subacute care beds. NFP nursing facilities have had a higher percentage of subacute care beds in each year. The logarithm of ancillary staff per 100 beds is positively associated with higher percentages of subacute care beds in each year. The number of physicians per 100 beds is statistically significantly associated with the percentage of subacute care beds in 1992, 1993, and 1994. Nursing facilities in states with higher occupancy rates have a higher percentage of subacute care beds. An aging population, CON/moratoria, and ratio of RNs to LPNs do not have statistically significant relationships with the percentage of subacute care beds.

Table 21
Seemingly Unrelated Regression Estimations for 1992-1995,
Freestanding Nursing Facilities
(n = 1,271)

| | 1992 | | 1993 | | 1994 | | 1995 | |
|---|---|---|---|---|---|---|---|---|
| | Beta[a]<br>(± SE) | t | Beta[a]<br>(± SE) | t | Beta[a]<br>(± SE) | t | Beta[a]<br>(± SE) | t |
| % Subacute Care Beds (Intercept) | 0<br>(11.25) | -0.71 | 0<br>(10.69) | -0.68 | 0<br>(10.28) | 0.43 | 0<br>(10.69) | -0.98 |
| Chain Affiliated | -0.008<br>(1.24) | -0.33 | -0.02<br>(1.17) | -0.90 | -0.02<br>(1.23) | -0.79 | -0.05<br>(1.40) | -2.04** |
| Medicaid Reimbursement | -0.13<br>(0.99) | -4.79*** | -0.21<br>(0.98) | -7.47*** | -0.26<br>(1.04) | -9.23*** | -0.27<br>(1.13) | -9.44*** |
| Ownership | -0.06<br>(1.42) | -2.12** | -0.05<br>(1.37) | -1.81* | -0.07<br>(1.46) | -2.93*** | -0.02<br>(1.60) | -1.04 |
| Metropolitan Area | 0.03<br>(1.72) | 0.97 | 0.04<br>(1.71) | 1.55 | 0.05<br>(1.78) | 1.98** | 0.07<br>(1.93) | 2.50** |
| CON/Moratoria | 0.03<br>(1.06) | 0.92 | 0.04<br>(1.06) | 1.29 | -0.03<br>(1.09) | -0.90 | -0.013<br>(1.17) | -0.46 |
| RN/LPN | 0.02<br>(0.20) | 0.88 | 0.02<br>(0.13) | 1.18 | -0.02<br>(0.19) | -0.70 | 0.0002<br>(0.24) | 0.007 |
| Physicians | 0.11<br>(0.007) | 4.23*** | 0.08<br>(0.010) | 3.78*** | 0.06<br>(0.004) | 2.96*** | -0.03<br>(0.006) | -1.15 |
| Log of Ancillary Staff | 0.16<br>(0.474) | 6.30*** | 0.11<br>(0.46) | 4.89*** | 0.12<br>(0.51) | 4.82*** | 0.13<br>(0.61) | 4.69*** |
| Occupancy Rate | 0.02<br>(0.13) | 0.52 | 0.05<br>(0.13) | 1.81* | 0.04<br>(0.12) | 1.65* | 0.08<br>(0.12) | 2.89*** |
| Aging Population (>65yrs) | 0.04<br>(0.30) | 1.55<br>(0.30) | -0.007<br>(0.29) | -0.26 | -0.007<br>(0.31) | -0.26 | 0.005<br>(0.33) | 0.20 |
| Durbin-Watson | | 1.809 | | 1.892 | | 1.820 | | 1.850 |
| First Order Autocorrelation | | 0.095 | | 0.054 | | 0.090 | | 0.075 |
| Degrees of Freedom | 5040 | | | | | | | |
| System weighted MSE | 0.99455 | | | | | | | |
| System weighted R-Square | 0.0512 | | | | | | | |

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[a] standardized coefficient

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

## Summary

This chapter presented the empirical results of the research. Analyses of the data were performed using univariate descriptive statistics; trend analysis; and time series cross-section regression analysis, including variance components models and seemingly unrelated regression estimates using SAS version 6.12.

The trend analysis revealed that during 1992-1995, subacute care services grew continuously as shown by the hospital-based, freestanding, and full models. Trend analyses by different categorical variables show the changes in growth. These results addressed research question one, which is whether the subacute care services have increased over the over the 1992-1995 period.

The time series cross-section regression analyses using variance components models and the seemingly unrelated regression method were presented in this chapter. The results from the variance components models show that SNF type, Medicaid reimbursement, ownership, metropolitan area, RN/LPN, physicians, ancillary staff, occupancy rate, and time are significantly associated with percentage of subacute care beds in the full model. In the hospital-based nursing facility model, chain affiliation, CON/moratoria, RN/LPN, physicians, ancillary staff, and occupancy rate are the important indicators for subacute services. In the freestanding nursing facility model, Medicaid reimbursement, ownership, metropolitan area, physicians, ancillary staff, occupancy rate, and time show significant relationships with the percentage of subacute care services in freestanding nursing facility model.

The seemingly unrelated regression estimates have results similar to the variance component models. Medicaid reimbursement and ancillary staff are strong indicators over the four-year period. Ownership, physicians, occupancy rate, SNF type, metropolitan area, and RN/LPN also are significantly associated with percentage of subacute care services. CON/moratoria shows a marginally significant relationship with the percentage of subacute beds in 1993. In the hospital-based model, physicians, ancillary staff, CON/moratoria, and occupancy rate have significant associations with percentage of subacute care beds. Ownership and RN/LPN are shown to be important indicators only in 1992. Medicaid reimbursement, ownership, metropolitan area, physicians, ancillary staff, and occupancy rate all have significant relationships with the dependent variable. In the freestanding model, chain affiliation is shown to be an indicator for 1995.

The finding and generalizations from the results are discussed in chapter six. Policy implications, limitations of the study, and suggested future research are also discussed in chapter six.

# CHAPTER 6
# CONCLUSIONS AND IMPLICATIONS

This chapter summarizes the results of this research and discusses the findings. Theoretical considerations are examined, and generalizations are drawn from this research in relation to previous empirical research. Finally, policy implications are explored. The limitations of the study are presented along with suggestions for future research.

## Major Findings and Discussions

The purpose of this study was to understand the changes in the provision of subacute care by SNFs and to identify environmental factors associated with the level of subacute care by using resource dependence theory. Most previous research has been done to explore the demand for and supply of nursing home beds for long-term care patients, or the quality of care in nursing home facilities. Few studies have looked at innovation in long-term care facilities. Developing a new level of care, such as subacute care, is still a challenge for providers, policymakers, and third-party payers.

The study presented findings from different models about the factors associated with the provision of subacute care beds in different models over the years 1992-1995. The study both explored the growth of subacute care beds, and expanded theoretical consideration of the relationship between environmental factors and resource dependence.

## Trend analysis of Subacute Beds (Research Question One)

The first research question asks about the increase in subacute care beds over the years 1992 through 1995 period. Figures 10 to 21 depict the growth of subacute care beds and the slopes of the changes. All nursing homes increased their subacute care beds from 1992 through 1995. The increase in hospital-based nursing facilities occurred in the first three years, and then growth slowed in 1995.

Not-for-profit SNFs have added more subacute care beds than for-profit SNFs. However, for FP nursing homes have a continuously increase in the slope of change. For-profit SNFs have the flexibility to develop more subacute care beds. The trend analysis of the growth of subacute care beds in relation to CON/moratoria shows that nursing homes located in states with no CON/moratoria regulations grew more quickly than those located in states with either CON or moratorium regulations. This finding is consistent with the findings from Harrington et al.'s study, in which states with CON and/or moratoria had significantly less growth in nursing home beds (Harrington, Swan, Nyman, and Carrillo, 1997).

Nursing facilities that participate only in the Medicaid program increased their subacute beds faster than those participating in other programs. However, the rates of change in other programs were decreasing. Metropolitan nursing facilities had a higher percentage of subacute care beds, but non-metropolitan nursing homes were growing faster than in metropolitan nursing homes.

Both chain and non-chain affiliated nursing homes were increasing subacute care beds every year. The rates of changes in subacute care beds showed that chain-affiliated

SNFs increased growth rates in 1993 and 1994, but not in 1995. The rates of change in subacute care beds for non-chain-affiliated SNFs increased in 1993 and 1995, but decreased in 1994.

The multivariate analysis of this study supports the first research question: subacute care beds grew continuously over the 1992-1995 period. The time variable was significantly associated with the level of subacute care services in the time series cross-section regression model. More subacute care beds were available in the later years, 1993-1995, holding other variables constant.

## Results of Tests of Hypotheses 1-9

This section discusses research questions 2 and 3, exploring the relationship between subacute care beds and environmental factors as well as comparing the hospital-based and freestanding nursing home models. The results of the tests of nine hypotheses are also presented here. Also, related empirical studies are reviewed to corroborate the findings of this study.

### Metropolitan Area (Hypothesis 1)

H1: SNFs in metropolitan areas have a higher percentage of subacute care beds than SNFs in non-metropolitan areas.

Multivariate analysis in the study found that freestanding nursing homes in metropolitan areas have a higher percentage of subacute care beds than those in non-metropolitan areas. The finding is consistent with several studies. Dunlop (1976) reported that metropolitan populations have been shown to use more services per capita

than rural populations, which would reflect higher use of services in states with more metropolitan areas (Dunlop, 1976). Harrington et al.'s study explored the relationship among change in nursing home beds, CON/moratoria, and Medicaid reimbursement, using panel regression. They found that the percentage of the population living in a metropolitan area was positively associated with an increase in nursing home beds (Harrington, Swan, Nyman, and Carrillo, 1997).

Since nursing homes in metropolitan areas are more likely than others to manage their own networks and affiliations, they are likely to have higher percentages of subacute care beds, and therefore offer more subacute care services. From the resource dependence standpoint, nursing homes in metropolitan areas have higher percentages of subacute care beds because these facilities have access to abundant and stable resources such as health care professionals, subacute care patients, and facilities.

On the other hand, as other studies have shown, the rural population is older and has higher levels of disability, which could create more demand in rural areas for nursing home care. Dubay (1993) showed that rural use of Medicare skilled nursing facility care is higher than that for urban beneficiaries, but the study did not examine use of long-term nursing home care (Dubay, 1993).

### CON/moratoria (Hypothesis 2)

H2: SNFs in states with active CON programs or moratoria on new construction have a lower percentage of subacute care beds than others.

The time series cross-section regression (TSCSREG) results show that percentages of subacute care beds are negatively related with CON/moratoria but not

significantly. The results of the hospital-based nursing facility model show a statistically significant negative relationship. Hospital-based nursing homes in states with either CON or moratoria have a lower percentage of subacute care beds than are those in states with no CON/moratoria regulations (Table 17). In other words, without the CON barrier, the number of subacute care beds in hospital-based SNFs has increased, while the number of subacute care beds in freestanding nursing homes has remained relatively constant. This reflects the high costs of land and the fact that to develop a new freestanding SNF requires a substantially greater investment than does converting unused hospital beds to a subacute care unit. This result is also consistent with several studies showing that states with CON/moratoria regulations did limit the growth of nursing home beds (DHHS, 1995; Harrington, Swan, Nyman, and Carrillo, 1997; Nyman, 1989; Zinn, 1994). CON are required in many states before any development and construction of a new subacute facility or implementation of a new subacute program (Griffin, 1995). The analysis indicates that restrictive CON/moratoria requirements for subacute care beds in nursing facilities may be a factor underlying many of the placement delays and access problems that hamper hospitals as they try to discharge their subacute care patients into post-acute settings.

### Chain Affiliation (Hypothesis 3)

> H3: Chain affiliated SNFs have a higher percentage of subacute care beds than independent SNFs.

Of particular interest is the number of nursing homes in the study sample that are part of multi-facility systems. Sixty-one percent of the freestanding nursing facilities are

owned by multi-facility systems. Thirty-eight percent of the hospital-based nursing homes are owned by multi-facility systems. The relationship between chain affiliation and percentage of subacute care beds is somewhat mixed in this study. On the one hand, using the variance component models, this study found that, in the full model and in the freestanding model, nursing homes being owned by multi-facility systems did not have a significant effect on the percentages of subacute care beds. However, the results for hospital-based variance component model (Table 17) show a positive and statistically significant association with the percentage of subacute care beds; hospital-based, multi-facility-system nursing homes have higher percentages of subacute care beds. The results show that hospital-based or chain-affiliated nursing facilities can secure more resources from their niches than freestanding nursing facilities can (p. 70 and p. 74).

On the other hand, in the results from the SUR model, chain affiliation shows a negative association with the percentage of subacute care beds in freestanding nursing facilities and only in 1995 (Table 21). That is, chain-affiliated facilities have lower percentages of subacute care beds. One possible reason is that freestanding nursing homes have their own resources; thus, the chain is not an important factor influencing subacute care services. This may also be due to the fact that chain-owned facilities do not have direct accountability for their nursing homes or because the management structure of some chain-owned facilities lacks effective oversight for subacute care services (Belwett, Kane, & Finch, 1995).

It is usually assumed that chain-affiliated nursing homes have an advantage over independent nursing homes due to joint purchasing agreements, shared labor costs, and centralized management. Although it is commonly assumed that chain ownership results

in lower costs due to economies of scale, the empirical evidence on that question is mixed. McKay's study found that chain affiliation is not statistically significantly associated with nursing home costs (McKay, 1991). Coburn, Fortinsky, McGuire, and McDonald found a similar result, that chain affiliation did not have a significant relationship with nursing home costs, by demonstrating the effectiveness of prospective payment systems in restraining nursing home costs (Coburn, Fortinsky, McGuire, and McDonald, 1993).

### Reimbursement (Hypothesis 4)

> H4: SNFs that participate only in Medicaid have a higher percentage of subacute care beds than other SNFs.

Medicaid reimbursement is not a significant factor in the percentage of subacute care beds in variance components model of hospital-based nursing homes (Table 17). Both the full model and the freestanding nursing home model show that nursing homes participating only in Medicaid were associated with higher percentages of subacute care beds (Table 16 and Table 18). In other words, Medicaid reimbursement is a factor facilitating the growth of subacute care beds in freestanding nursing homes, while the percentages of subacute care beds in hospital-based nursing facilities remained relatively constant. Because Medicaid rates are frequently lower than either Medicare or self-pay rates, and facilities dependent on Medicaid as a major source of revenue may be resource constrained. Therefore, it is possible that nursing homes participating only in Medicaid also admit self-pay or managed care patients in order to cover the additional costs of subacute care.

These results are consistent with several other studies` findings. Coburn, Fortinsky, McGuire, and McDonald (1993) evaluated the effect of Maine‘s Medicaid nursing home prospective payment system for nursing homes on the nursing homes' costs and on access to care by public patients. They found that since Medicaid payment programs constrain nursing home payment rates over time, nursing homes would seek to admit more private pay patients at the expense of spaces for Medicaid patients. Swan, Harrington, and Grant (1988) reported that nursing home payment reforms in some states have created incentives to admit patients needing more care. By 1988, case-mix-related payment systems based on multiple levels of care and resource utilization had replaced payment based on just two levels of care, skilled and intermediate, in 13 states up from 4 levels in 1978 (Swan, Harrington, Grant, and Preston, 1988). Under these more recent systems, care provided to Medicaid recipients in subacute care units may be reimbursed at high rates. In Banaszak-Holl, Zinn, and Mores’ study (1996), they found that a higher proportion of Medicare hospital discharges at the county level is associated with less likelihood that subacute care is provided in dedicated units.

Nursing homes participating only in Medicaid may offer special care in order to be favorably positioned in particular market segments (Zinn and More, 1994). Medicaid nursing homes providing subacute care services could dissipate the negative image of nursing home care in order to increase market share in the private pay sector. In contrast, another study showed opposite results; as Medicaid nursing home reimbursement rates were not shown to be related to changes in bed stock (Harrington, Swan, Nyman, and Carrillo, 1997). However, in that study changes in bed stock were defined as being for overall nursing home beds instead of subacute care beds.

Overall, the present study found a strong relationship between Medicaid reimbursement and subacute care beds, especially for the full model and the freestanding nursing facility model. The findings corroborated those of other empirical studies (Banaszak-Holl, Zinn, and More, 1996; Swan, Harrington, Grant, and Preston, 1988; Zinn and More, 1994). Nursing facilities with higher proportions of Medicaid patients tend to provide subacute care in order to change their image, increase their private pay portion, and expand their share of the subacute care market.

### Ownership (Hypothesis 5)

H5: For-profit SNFs have a lower percentage of subacute care beds than not-for-profit SNFs.

This study examined the difference between NFP and FP nursing facilities in providing subacute care beds, using pooled time-series, cross-sectional regression analysis. The model estimations tested a hypothesis based on a conceptual model of the resource dependence differences between FPs and NFPs, and on previously reported empirical research. Several studies show that FPs and NFPs differ in resource allocation, with for-profit nursing homes using lower overall expenditures and lower staffing levels (Coburn et al., 1993; Cohen and Dubay, 1990; Davis, 1993; Fottler, Smith, and James, 1985; Weisbrod, 1993). Table 16 shows that NFP nursing facilities have higher percentages of subacute care beds than FPs do. This result implies that NFP nursing facilities seek to provide the multi-dimensional services by adding more subacute care services, unconstrained by profit considerations. NFP facilities may provide higher percentage of subacute care beds because they recognize the community service mission

of health care and are willing to subsidize this mission by seeking funding from sponsoring organizations. This finding is also consistent with Cotter's (1996) results; NFP nursing facilities are likely to provide the special care unit in Alzheimer's diseases.

This study also found that the NFPs have higher ratios of RNs to LPNs than FP nursing homes (Figure 9). The association of NFP ownership with higher levels of staffing suggests that the higher costs exist in NFPs because they have better staffing. These results are consistent with a number of studies that have suggested that NFP nursing homes may have better staffing and provide a higher quality of care (Aaronson, Zinn, and Rosko, 1994; Davis, 1993).

Blewett, Kane, and Finch analyzed the relationship between hospital ownership and the use of post-acute care. They found that hospital ownership of post-acute care facilities is significantly associated with use of post-acute care for patients discharged after hospitalization for stroke and chronic obstructive pulmonary disease. However, if nursing homes, particularly hospital-based SNFs, are at full capacity, nursing home ownership may not increase the likelihood of hospitals discharging patients to post-acute care (Blewett, Kane, and Finch, 1995/1996).

### SNF Type (Hypothesis 6)

H6: Hospital-based SNFs have a higher percentage of subacute care beds than freestanding SNFs.

Several studies have examined the effects of provider type, such as institutional setting, affiliation, or ownership, on utilization and expenditures. However, few studies have compared the behaviors of hospital-based SNFs and freestanding SNFs, particularly

in the provision of subacute care. This study found that hospital-based nursing facilities were associated with higher percentages of subacute care beds. From the resource dependence perspective, hospital-based SNFs have more resources in plants, equipment, and staffing, which are critical resources. Thus, owning the critical resources increases a nursing home's ability to cope with the changing health care environment. Hospital-based subacute care can provide hospitals with places where they can transfer their patients, eliminating the placement problems in achieving faster patient turnover.

### Physician Staff (Hypothesis 7)

> H7: SNFs with more physicians per 100 beds are associated with higher percentages of subacute care beds.

In this study, the full model, hospital-based model, and freestanding model all found that nursing homes with more physicians per 100 beds are associated with more subacute care beds. An increased physician staff means that subacute care providers can take patients with more severe conditions, as physicians are more actively involved in providing the subacute care. The phenomenon probably is related to accreditation. AHCA's study (1996) found that 43 percent of those surveyed (133 nursing homes) were accredited by the JCAHO, and 15 percent were accredited by the CARF. Although accreditation may be a tool to attract more subacute care patients, the accreditation standards do affect physician staff. For example, JCAHO standards require physicians to "closely and frequently" monitor patients in subacute care settings. Physicians' visits to patients occur more often on a subacute care unit than in traditional long-term care facilities.

Contrasting results were found by Schlenker, Shaughnessy, and Yslas (1985), using 1980 patient-level data to examine nursing home resource consumption in relations to different patient characteristics: Medicaid versus non-Medicaid, and skilled-level care versus intermediate-level care (Schlenker, Shaughnessy, and Yslas, 1985). They found no difference in resource consumption for physicians between these groups. However, they found that resource consumption for professional nursing is significantly higher for non-Medicaid than for Medicaid patients, with a more intense case mix for non-Medicaid patients.

In summary, the level of physicians per 100 beds was significantly associated with the percentage of subacute care beds in a facility. Subacute care has now become a form of continuing care, between acute care and long-term care. It is believed that the growing subacute services need more professional staff trained in acute care settings. Moreover, other empirical studies (e.g., AHCA, 1996) show that subacute care patients are referred by hospitals and physicians, so subacute care nursing facilities must maintain good relationships with other providers such as acute care hospitals, rehabilitation hospitals, and physician networks, in order to gain their critical resources, patients and physicians.

### Ancillary Staff (Hypothesis 8)

H8: SNFs with more ancillary staff per 100 beds are associated with higher percentages of subacute care beds.

The definition of ancillary staff in this study includes physical therapists, occupational therapists, speech pathologists, social workers, pharmacists, and registered

dietitians. As noted in the literature review, three approaches can be taken in managing ancillary services. First, nursing facilities can contract with a rehabilitation therapy service for approved therapy services and associated billing under Medicare Part B. Second, facilities can contract for therapists, but bill directly for services. Third, facilities can employ all ancillary staff and bill all services under routine costs. The results of this study suggest that most ancillary staff (except social workers) work under contract with nursing facilities. It is less costly to use contract ancillary staff than to hire full-time staff. Recruiting or retaining full-time physical and occupational therapists is competitive and difficult, and the facility risks costs due to insufficient demand for its rehabilitative services. In the health care industry as a whole, growing demand has caused a shortage of trained therapists, making recruitment and retaining of rehabilitation professionals difficult.

This study includes the logarithms of ancillary staff in the regression model, to test Hypothesis 8. The logarithm of ancillary staff was statistically significantly related to the percentage of subacute care beds. The finding supports the hypothesis that SNFs with more ancillary staff have higher percentages of subacute care beds. Nursing facilities with a large percentage of subacute services need more ancillary staff to provide rehabilitation therapy. The results also suggest that facilities provide more ancillary services. The growth of ancillary services was facilitated by Medicare reimbursement for the SNFs offering them. The importance of rehabilitation in nursing homes was also reinforced by the Omnibus Budget Reconciliation Act of 1987 (OBRA). OBRA required nursing homes to improve the quality of life of their residents by providing comprehensive assessment, individual treatment planning, and services to allow every

resident to attain or maintain the highest possible mental and physical functional status (OBRA, 1987).

To conclude this section, the logarithm of ancillary staff per 100 beds is strongly and positively associated with the percentage of subacute care beds. Increasing ancillary staff implies an increase in the need for rehabilitative services and other ancillary services. The change may be caused by Medicare reimbursement and OBRA regulations.

Nursing Staff (Hypothesis 9)

> H9: SNFs with a higher ratio of RNs to LPNs are associated with higher percentages of subacute care beds.

The ratio of RNs to LPNs shows significant and positive association with the percentage of subacute care beds in the full and the hospital-based models, but not in the freestanding nursing facility model. It is possible that hospital-based nursing facilities, having more nursing staff available, are more willing to admit patients who need more care than freestanding nursing facilities. Given the projected growth of the elderly population, subacute care appears to be an area of potential growth for RN employment. With the emergence of rehabilitative services in nursing homes and their increasingly complex case-mix, the need for RNs is much greater now than ever before, and will be in the years ahead.

Figure 21 shows the continuing change in the ratio of RNs to LPNs in nursing facilities over the four-year period. Staffing changes indicate that there are more RNs/LPNs that would be able to provide subacute care services. The growth in nursing facilities RN staffing could be a result of several factors. First, the number of subacute

care and special care units have increased. Second, the 1987 OBRA requires nursing facilities to provide 24-hour coverage by licensed nurses (OBRA, 1987). Third, during the late 80s and early 90s, hospitals dismissed many of their RNs.

The findings from this study are consistent with several studies. Moss found a slight increase in RNs in nursing facilities, from 6.6 percent of the RN workforce in 1988 to 7 percent in 1992 (Moss, 1994). The AHCA survey 133 nursing homes found direct care nurse staffing is higher in the subacute units than in the other parts of the nursing facilities (AHCA, 1996). A comparison of data from the 1985 National Nursing Home Survey (NCHS, 1988) reveals that the overall staffing ratios of RN time to total nursing staff time per resident day increased very slightly, over the 18 minutes of RN time and 2 hours of total staff time per resident day reported in 1985 (NCHS, 1988). Most facilities have fewer nursing staff (both licensed and total) on evening and night shifts and on holidays and weekends than during daylight or "regular" hours of operation.

However, increasing nursing staff alone does not assure high quality. Kane cites Friedlob's 1993 doctoral dissertation, which analyzed the results of a large sample of nursing homes and their residents in 6 states (Kane, 1995). About 39 percent of the sample received no care from an RN during the 24-hour study period; the average RN time per resident was 7.9 minutes; the average LPN time, 15.5 minutes; the average nurse assistant (NA) time, 76.9 minutes (Kane, 1995). Most of the RNs working full-time in nursing homes provide no direct nursing care. A study by Wunderlich, Sloan, and Davis (1996) found that more than 87 percent of RNs working full time in nursing homes serve as head nurses, assistant head nurses, directors of nursing, or assistant directors of nursing. The authors suggest that a major shift of experienced RNs from hospitals to

nursing facilities is unlikely. They argue that as long as long-term care is almost totally dependent on public and out-of-pocket financing, the current paucity of RNs in nursing homes is likely to continue because the fiscal reasons that hospitals pay RNs more than nursing homes (Wunderlich, Sloan, and Davis, 1996).

In summary, using the ratio of RNs to LPNs as one independent variable to explore the relationship between nursing staff and subacute care beds, this study found that higher ratios of RNs to LPNs are associated with the higher percentages of subacute services. Nursing homes with more subacute care beds having more RN staff that may be treating more severely ill patients.

## Other Results

### Occupancy Rate

The data show a generally high level of nursing facility occupancy across states, reflecting that bed supply is constrained. Occupancy rate can be one index of competition, and competition among nursing facilities is an incentive for them to innovate. Findings from this study show that nursing homes in states with higher occupancy rates have higher percentages of subacute care beds. These findings are consistent with the view that facilities in less competitive markets are less likely to provide specialty care (Banasak-Holl, Zinn, and Mor, 1996). Several studies have examined the relationship between occupancy rate and nursing home capacity. Nyman's research demonstrated that an average nursing home located in underbedded markets spends considerably less per patient day than do facilities that are in markets with

abundant bed supplies (Nyman, 1989). In a study by Reschovsky (1996), bed availability had a significant positive association with the demand for nursing home beds for Medicaid beneficiaries.

Other studies investigated the relationship between occupancy rate and nursing home costs. Holmers (1996) examined occupancy rate as a factor affecting nursing home costs. She concluded that higher occupancy has a significant negative effect on nursing homes' per diem plant costs and per diem patient costs. Rosko et al. (1995) studied 461 nursing homes in Pennsylvania to examine the relationship between labor efficiency and environmental characteristics. They also found that occupancy rate is positively associated with efficiency (Rosko, Chilingerian, Zinn, and Aaronson, 1995). Neither of these studies explored subacute care costs. Future research should investigate whether higher occupancy rates in nursing homes, subacute care units means lower costs for the subacute care providers.

In summary, this study concluded that SNFs in states with higher occupancy rates are associated with higher percentages of subacute care beds. Also, a generally high level of nursing home occupancy across states indicates that the bed supply is constrained.

## Summary of the Major Findings and Conclusions

This study found that nursing homes increased the subacute care beds over the 1992 through 1995 period. Hospital-based nursing facilities have higher percentages of subacute care beds than freestanding nursing homes. However, the percentage of

subacute care beds in freestanding nursing homes grew more quickly than that in hospital-based nursing facilities over the years 1991 to 1995.

Tables 22 to 27 summarize the results of testing the hypotheses. The results support several of the hypotheses presented in Chapter 3. In the variance components models, the full model shows that metropolitan area, Medicaid reimbursement, ownership, SNF type, number of physicians, number of ancillary staff, and the ratio of RNs to LPNs are important factors in the percentage of subacute care beds. CON/moratoria, chain affiliation, number of physicians, number of ancillary staff, and the ratio of RNs to LPNs are significantly associated with percentages of subacute care in hospital-based SNFs. Metropolitan area, Medicaid reimbursement, ownership, number of physicians, and number of ancillary staff are significant indicators in the freestanding SNFs.

This study indicates a strong relationship between Medicaid reimbursement and subacute beds, especially in the full model and the freestanding SNF model. Nursing homes participating only in Medicaid are associated with more subacute care beds. The findings are consistent with Mor et al.'s research (Mor, Banazak-Holl, and Zinn, 1996). In their studies, nursing facilities with higher proportions of Medicaid patients tend to provide higher -acuity care in order to improve their image, increase their proportions of private pay, and expand their subacute care market share (Mor, Banazak-Holl, and Zinn, 1996).

Nursing facilities in metropolitan areas are likely to have more subacute care beds. Hospital-based SNFs also have higher percentages of subacute care beds. It is apparent that nursing homes in metropolitan areas and hospital-based facilities can access

to a range of resources. This corroborates the commonly held belief that facilities with more plentiful and stable resources increase their abilities to cope with the innovations in long-term care.

It is commonly assumed that chain-affiliated nursing homes have an advantage over independent nursing homes due to shared labor costs and centralized management. Among hospital-based SNFs, chain-affiliated SNFs have higher percentages of subacute services than non-affiliated SNFs do; but not in the freestanding model.

This study found that NFP nursing facilities have a higher percentage of subacute care beds, implying that NFP nursing homes change their service mix in accordance with their commitment not to seek profits. The NFP facilities provision of subacute care also reflects their mission to serve the community. NFP nursing facilities also have, on average, higher levels of staffing, which may suggest both higher costs and better care.

Hospital-based nursing homes in states with either CON or moratoria have lower percentages of subacute care beds. CON/moratoria regulations are barriers to the increase of subacute care beds in nursing facilities. This study found that without CON/moratoria, the percentage of subacute care beds in hospital-based SNFs increases, while the number of subacute care beds in freestanding SNFs remains relatively constant. The finding reflects the high costs of land and the fact that to develop a new freestanding SNF requires a substantially greater investment than does converting unused hospital beds to a subacute care unit.

Variables concerning the levels of health professionals, including physicians, ancillary staff, and RN/LPN ratios, were significantly and positively associated with higher percentages of subacute care beds. The growing subacute care services need more

professional staff trained by acute care providers. The need for higher levels of health professionals suggests that facilities are taking care of patients, who need more ancillary services and nursing care.

Table 22. Summary of the Results of Testing the Hypotheses
(Fuller-Battese Method)

| Hypotheses | Variance Component Model (Fuller-Battese Method) | | |
|---|---|---|---|
| | All Nursing Homes (N = 5,884) | Hospital-Based (N = 800) | Freestanding (N = 5,084) |
| 1. Metropolitan Area | ✓ [a](+)[b] | | ✓ (+) |
| 2. CON/Moratoria | | ✓ (-) | |
| 3. Chain-Affiliated | | ✓ (+) | |
| 4. Medicaid Reimbursement | ✓ (-)[b] | | ✓ (-) |
| 5. Ownership | ✓ (-) | | ✓ (-) |
| 6. SNF Type | ✓ (+) | | |
| 7. Physicians | ✓ (+) | ✓ (+) | |
| 8. Ancillary Staff | ✓ (+) | ✓ (+) | ✓ (+) |
| 9. RN/LPN | ✓ (+) | ✓ (+) | |
| Time Effect | ✓ (+) | | ✓ (+) |

[a] Indicates the results are significant.

[b] ± shows direction of supported hypotheses.

Table 23. Summary of the Results of Testing the Hypotheses (Da Silva Method)

| Hypotheses | Variance Component Model (Da Silva Method) | | |
|---|---|---|---|
| | All Nursing Homes (N = 5,884) | Hospital-Based (N = 800) | Freestanding (N = 5,084) |
| 1. Metropolitan Area | ✓ [a](+)[b] | | ✓ (+) |
| 2. CON/Moratoria | | ✓ (-) | |
| 3. Chain-Affiliated | | ✓ (+) | |
| 4. Medicaid Reimbursement | ✓ (-) | | ✓ (-) |
| 5. Ownership | | | ✓ (-) |
| 6. SNF Type | ✓ (+) | | |
| 7. Physicians | ✓ (+) | ✓ (+) | ✓ (+) |
| 8. Ancillary Staff | ✓ (+) | ✓ (+) | ✓ (+) |
| 9. RN/LPN | ✓ (+) | ✓ (+) | |
| Time Effect | ✓ (+) | | ✓ (+) |

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[a] Indicates the results are significant.

[b] ± shows direction of supported hypotheses.

Table 24. Summary of the Results of Testing the Hypotheses For 1992 (Seemingly Unrelated Regression Model)

| Hypotheses | All Nursing Homes (N = 5,884) | Hospital-Based (N = 800) | Freestanding (N = 5,084) |
|---|---|---|---|
| 1. Metropolitan Area | | | |
| 2. CON/Moratoria | | ✓ (-) | |
| 3. Chain-Affiliated | | | |
| 4. Medicaid Reimbursement | ✓ [a](-)[b] | | ✓ (-) |
| 5. Ownership | ✓ (-) | ✓ (-) | ✓ (-) |
| 6. SNF Type | | | |
| 7. Physicians | ✓ (+) | ✓ (+) | ✓ (+) |
| 8. Ancillary Staff | ✓ (+) | ✓ (+) | ✓ (+) |
| 9. RN/LPN | ✓ (+) | ✓ (+) | |

[a] Indicates the results are significant.

[b] ± shows direction of supported hypotheses.

Table 25. Summary of the Results of Testing the Hypotheses For 1993 (Seemingly Unrelated Regression Model)

| Hypotheses | All Nursing Homes (N = 5,884) | Hospital-Based (N = 800) | Freestanding (N = 5,084) |
|---|---|---|---|
| 1. Metropolitan Area | | | |
| 2. CON/Moratoria | | | |
| 3. Chain-Affiliated | | | |
| 4. Medicaid Reimbursement | ✓ [a](-)[b] | | ✓ (-) |
| 5. Ownership | ✓ (-) | | ✓ (-) |
| 6. SNF Type | ✓ (+) | | |
| 7. Physicians | ✓ (+) | ✓ (+) | ✓ (+) |
| 8. Ancillary Staff | ✓ (+) | ✓ (+) | ✓ (+) |
| 9. RN/LPN | ✓ (+) | ✓ (+) | |

[a] Indicates the results are significant.

[b] ± shows direction of supported hypotheses.

Table 26. Summary of the Results of Testing the Hypotheses For 1994 (Seemingly Unrelated Regression Model)

| Hypotheses | All Nursing Homes (N = 5,884) | Hospital-Based (N = 800) | Freestanding (N = 5,084) |
|---|---|---|---|
| 1. Metropolitan Area | ✓ [a](+)[b] | | ✓ (+) |
| 2. CON/Moratoria | ✓ (-) | ✓ (-) | |
| 3. Chain-Affiliated | | | |
| 4. Medicaid Reimbursement | ✓ (-) | | ✓ (-) |
| 5. Ownership | ✓ (-) | | ✓ (-) |
| 6. SNF Type | ✓ (+) | | |
| 7. Physicians | ✓ (+) | ✓ (+) | ✓ (+) |
| 8. Ancillary Staff | ✓ (+) | ✓ (+) | ✓ (+) |
| 9. RN/LPN | | | |

[a] Indicates the results are significant.

[b] ± shows direction of supported hypotheses.

Table 27. Summary of the Results of Testing the Hypotheses For 1995 (Seemingly Unrelated Regression Model)

| Hypotheses | All Nursing Homes (N = 5,884) | Hospital-Based (N = 800) | Freestanding (N = 5,084) |
|---|---|---|---|
| 1. Metropolitan Area | ✓ [a](+)[b] | | |
| 2. CON/Moratoria | | | |
| 3. Chain-Affiliated | | | ✓ (-) |
| 4. Medicaid Reimbursement | ✓ (-) | | ✓ (-) |
| 5. Ownership | | | |
| 6. SNF Type | | | |
| 7. Physicians | | ✓ (+) | |
| 8. Ancillary Staff | ✓ (+) | | ✓ (+) |
| 9. RN/LPN | | | |

[a] Indicates the results are significant.

[b] ± shows direction of supported hypotheses.

## Implications

The extreme pressures on hospitals to discharge patients from acute care make the emergence of subacute care units and facilities to provide skilled nursing and recuperative care likely to be the most volatile feature of health care services over the course of the next decade. The findings of the study raise a number of research and policy issues that merit further investigation.

First, the results show the usefulness of distinguishing between the behaviors of hospital-based SNFs and those of freestanding SNFs. For example, chain affiliation, CON/moratoria, RN/LPN ratios, number of physicians, number of ancillary staff, and occupancy rates are important factors explaining the growth of subacute care beds in hospital-based SNFs. For freestanding SNFs, however, Medicaid reimbursement, ownership, metropolitan location, and time effect become more meaningful indicators to explain the growth of subacute services. The number of ancillary staff is also significantly related to the percentage of subacute care beds in freestanding nursing homes.

Second, the shift of subacute care services to nursing facilities has implications for both the cost and the quality of nursing home care. There is considerable debate about the effect of subacute care on overall health care costs. The results of this study suggest that NFP nursing homes have a higher percentage of subacute care beds. Since NFP nursing facilities are restrained to seek profit maximization, the nursing home industry's development of subacute care may be more mission-driven than a response to reimbursement incentives.

Third, from a policy perspective, either supply- or demand-side strategies can increase capacity. The results of this study suggest that nursing homes in states with active CON/moratoria regulations are associated with lower percentages of subacute care beds. CON/moratoria regulations are a barrier to entering the subacute care market: without the CON barrier, the number of subacute care beds in hospital-based SNFs in the study sample increased, while the number in freestanding nursing homes remained relatively constant. The phenomenon reflects it may be possible that developing a new freestanding SNF requires a substantially greater investment than does converting unused hospital beds to a subacute care unit.

Fourth, physicians caring for subacute patients in nursing facilities will become more common in the near future. Based on the results of this study, nursing facilities with more physicians per 100 beds are associated with more subacute care beds. Specialists such as gerontologists, cardiologists, neurologists, rheumatologists, urologists, oncologists, and dermatologists are needed in subacute care units. Nursing facilities can recruit the physicians either by contracting out with other providers or by employing their own physicians to provide and direct medical and rehabilitation programs for subacute care. As physicians become more involved in SNFs, subacute care facilities may become a potential area of employment for physicians.

Fifth, not only physicians, but also other health care professionals are included in the SNF staffing of this study. The professions include registered nurses, licensed practical nurses, physical therapists, occupational therapists, registered dietitians, speech therapists, pharmacists, and social workers. The findings suggest how subacute care providers are rearranging their staffing mix to face the increasing subacute care beds.

Sixth, it is well known that hospitals shrank their staffs during the late 1980s and early 1990s (Duffy and Friedman, 1993; Lillie-Blanton, Felt, Redmon, Renn, Machlin, and Wennar, 1992). Hospitals with chronic financial losses may respond either by closing, or by drastically changing their services and patient mix. Thus, hospitals may seek multi-dimensional services to address hospital financial crises and to survive in the competitive health care market. One of their alternatives is to convert their empty beds to subacute care rather than closing them. As this study supports the argument that hospital-based SNFs have gained more critical resources in terms of plants, equipment, and personnel, hospitals have the opportunity to establish vertical integration and become part of the nursing home industry.

Finally, this study developed and applied a model, derived from resource dependence theory, to help analyze the nursing home subacute care industry. Environmental constraints, such as PPS implementation, the growth of managed care, new technology, the growth of the aging population, multi-dimensional services competition, and CON/moratoria regulations influence the stability of resources for nursing facilities. Furthermore, nursing facilities engage in exchange relationships with elements of the health care environment to face the uncertainty in that environment. Thus, this study adds empirical evidence to the knowledge base for organizational theory.

## Study Limitations

Several limitations exist in this study concerning data availability, measurement, and inferences. First, data about the admission sources of subacute care patients are not available in this study. It is not known whether the subacute patients discharge to acute

care hospitals, home health care, or other community services. There were no available data on the discharge destinations of subacute care patients. Thus, it is not clear whether the subacute care patients come from acute care hospitals or from home care. Without such necessary data, it is difficult to compare the performance of the different types of subacute care providers. An essential issue for further research is the quality of care given in subacute care units in nursing facilities.

Second, this study did not include personal income as a control variable. It is an arguable question whether the personal income per capita variable should be included in this study. On the one hand, personal insurance and income determines the ability of patients to pay privately for nursing home care. Chiswick found a positive relationship between median family income and use of state nursing homes, and Scanlon found a positive relationship between state income per capita and use of state nursing homes (Chiswick, 1976; Scanlon, 1980). Studies of individuals have also shown positive relationships between income and utilization (McCoy and Edwards, 1981; Shapiro and Tate, 1985). However, a Reschovsky study of demand for and access to institutional long-term care found that economic factors: prices, incomes, and wealth are not strong predictors of nursing home demand (Reschovsky, 1996). This study used individual nursing homes as the unit of analysis. It may be interesting to include personal income and insurance in the equation model when the unit of analysis is aggregated to county or metropolitan statistical area (MSA) level.

Third, case mix data for the nursing home industry are not available in most states. Only a few states have established nursing home case mix. Without accounting for risk adjustment factors (besides aging population) in this study, it is not clear whether

large nursing homes or hospital-based nursing facilities are taking care of patients with greater acuity.

Fourth, this study used number of subacute care beds instead of number of patients using those subacute care beds as the dependent variable. According to Nyman, if the use of nursing home beds is overwhelmingly determined by the supply of beds, it should not matter whether the dependent variable in the bed supply equation is the number of beds or the number of patients using those beds (Nyman, 1989). It would be interesting to have data on services use and to use the different dependent variable to conduct similar research.

Fifth, this study assumed that PPS implementation has affected the growth of subacute care. However, OSCAR long-term care files were created after 1991 and data were not complete in 1991. Thus, it is not certain whether the development of subacute care is a response to reimbursement incentives.

Finally, a managed care penetration variable is not included in this model. One study that investigated organizational and environmental factors associated with the provision of specialty care in designated units in nursing care facilities has used county as the unit of analysis (Banaszak-Holl et al., 1996). The authors found that facilities in markets with large HMO populations are more likely to operate subacute care units but not more likely to have a dedicated Alzheimer's unit. It is believed that managed care is now emerging in the subacute care market, seeking lower cost alternatives (Banaszak-Holl et al., 1996). Thus, future study should include managed care penetration in a study model, particularly for county or MSA markets.

## Future Research

This study defines the subacute care beds as the number of beds for care of AIDS, dialysis, disabled children, head trauma, hospice, Huntington's, special rehabilitation, and ventilator use. Future study using different definitions of subacute care services to examine similar research questions is recommended. This study identifies certain factors that may influence a nursing facility's subacute care services. Future research might consider other factors and refine those considered here. Data for more than four years to detect the growth of subacute care services would be very helpful. Also, data for patient characteristics, service mix, payer mix, and case mix would be useful to help examine the research issue. Data on subacute care cost should be sought to investigate the cost and the effectiveness of subacute services as a substitute for hospital acute care.

This study raises issues about ownership and chain affiliation. It is interesting that ownership is a significant indicator for hospital-based and for freestanding nursing facilities when different statistical analyses are used. Chain affiliation is an important factor in the health care industry. Further study might examine subacute services by differentiated ownership and chain affiliation, for example, chain-for-profit, independent-for-profit, and nonprofit/government.

This study explicates the relationship between professional staff and subacute services. Further study might compare a nursing facility's performance, including both effectiveness and efficiency, with different combinations of contract, part-time, and full-time professional staffing. Another area of interest for future research is to examine the

relationship between subacute care services and the nursing staff, including professional (RNs and LPNs) and paraprofessional staffing (nurse aides).

More in-depth studies of all nursing facilities in market areas would enhance the model's attempt to look at the county level, to yield more information on market characteristics. In addition, managed care penetration should be included in the model to explore the relationship between managed care penetration and subacute care services.

Since there has been no exact assessment of whether or not the distribution of subacute care beds reflects the underlying population need for any of the categories of special care described in this study, future study should assess the need for subacute care services. Future research should also investigate the rationale and the goals of states for retaining or removing regulatory controls on subacute care services and also the political factors that affect the state's process for deciding on policies.

In this study some nursing facilities had no subacute care beds in 1992, but included them in the following years. Others offered subacute care beds in the 1992, but ended with no subacute care unit in 1995. Future research could explore the reasons that nursing homes either drop from or enter into subacute care markets.

Finally, the home health care industry, as one alternative to hospital and ambulatory care, is currently one of the fastest growing sectors of the health care market. Home care performs most diagnostic and therapeutic interventions normally carried out in the hospital, but in the patient's home. It is believed that some home health care agencies provide subacute services, too. Home care may be the most cost-effective form of health care, especially for older individuals. Therefore, it will be interesting to investigate the extent to which home care or community services do or should substitute

for more costly inpatient or institutional care. Future research can use the same definition of subacute services to compare the outcomes as well as cost-effectiveness of different settings, including hospital-based nursing facilities, freestanding nursing facilities, and home health care.

## Summary

Nursing facilities are expanding to cover subacute care. Subacute care is increasing being accepted more and more as an alternative for cost-effective health care delivery. Subacute care units of nursing facilities are emerging in response to the need to care for patients who suffer from medical conditions or are recovering from surgical procedures and need a broad range of medical and rehabilitative care, but are discharged from hospitals.

This chapter has attempted to interpret the results of this research in a manner that is directly useful to policy makers, regulators, health care providers, and consumers. This study has shown that the growth of subacute care beds is influenced by several factors, including SNF type, chain affiliation, Medicaid reimbursement, ownership, metropolitan location, RN/LPN ratio, physicians, ancillary staff, and occupancy rate. In addition, although nursing home system affiliation showed a mixed association with the percentage of subacute care beds, this variable should not be overlooked as hospitals continue to integrate both vertically and horizontally, with new potential financial incentives for the use of subacute care services.

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# APPENDICES

# Appendix A

## Summary of Key Distinctions Among The Types of Subacute Care Facilities

| Provider Type | Characteristics |
|---|---|
| Freestanding SNFs | - more managed care patients than other providers<br>- tend to contract out more services (therapies, lab, x-ray)<br>- much more marketing<br>- stronger focus on providing evidence of outcomes and providing protocols than some long-term care hospitals<br>- case management is part of care process (liaison with managed care plan)<br>- interdisciplinary teams<br>- discharge focus from day 1 (special focus for managed care patients) |
| Hospital-based SNFs | - dominated by Medicare FFS patients<br>- some doctors more comfortable referring patients to hospital-based SNFs, but this only matters where doctors still have some control (i.e., FFS)<br>- said by the other providers to be creaming "clean" hips and "clean" strokes<br>- access to more resources<br>- fewer readmits<br>- interdisciplinary teams<br>- discharge focus from day 1 (concern about patients no longer qualifying for Medicare skilled care) |
| Long-Term Care Hospitals | - great variation among these hospitals<br>- the "old TERFA" long-term care hospitals in Boston each appeared to be providing unique services for special populations (e.g., long stay and complex care for Medicaid patients; intense "rehabilitation" for patients with problems beyond the "HCFA 10;" one specialty program for the morbidly obese)<br>- meet acute care hospital criteria<br>- more physicians than SNF-based subacute; possibly fewer than in the rehabilitation hospitals |
| Rehabilitation Hospital and Units | -traditional outcomes focus; substantial experience with FIMs and other measures<br>- Medicare FFS<br>- meet acute care criteria<br>- patients typically have more intensive rehabilitation requirements (not a broad spectrum of patients, as per HCFA reimbursement regulations)<br>- more physicians than other subacute care providers<br>- interdisciplinary |

Source: Subacute care : Policy Synthesis and Market Area Analysis (p.4-4), by Lewin-VHI, Inc., 1995, copyright 1995 by DHHS.

# Appendix B
## Abbreviations of variables and Definitions

| Abbreviations of Variables | Definitions |
|---|---|
| PROSUB | Percentage of subacute care beds<br>= (total subacute care beds/TOTBED)*100 |
| RN | Total number of registered nurses<br>= (0.25*RNC[1] + 0.50*RNP[2] + RNF[3]) |
| LPN | Total number of licensed practical nurses<br>= (0.25*LPNC[1] + 0.50*LPNP[2] + LPNF[3]) |
| RN_LPN | The ratio of RN to LPN<br>= RN/LPN |
| MD | Total number of medical directors<br>= (0.25*MDC[1] + 0.50*MDP[2] + MDF[3]) |
| DR | Total number of physicians<br>= (0.25*DRC[1] + 0.50*DRP[2] + DRF[3]) |
| PH | Percentage of physicians per 100 beds<br>= (MD+DR)/TOTBED*100 |
| OT | Total number of occupational therapists<br>= (0.25*OTC[1] + 0.50*OTP[2] + OTF[3]) |
| PT | Total number of physical therapists<br>= (0.25*PTC[1] + 0.50*PTP + PTF[3]) |
| ST | Total number of speech pathologists<br>= (0.25*STC[1] + 0.50*STP[2] + STF[3]) |
| DRUG | Total number of pharmacists<br>= (0.25*DRUGC[1] + 0.50*DRUGP[2] + DRUGF[3]) |
| SOCIAL | Total number of social workers<br>= (0.25*SOCIALC[1] + 0.50*SOCIALP[2] + SOCIALF[3]) |
| DIET | Total number of registered dietitians<br>= (0.25*DIETC[1] + 0.50*DIETP[2] + DIETF[3]) |
| ANCILL | (OT+PT+ST+DRUG+SOCIAL+DIET)/TOTBED*100 |
| TOTBED | Total number of beds in a facility; including those in non-participating or non-licensing area |
| OCC | Occupancy rate |
| OLD | Elderly population (greater or equal to 65) |
| HOSPBASE | SNF types |
| CHAIN | Chain affiliation |
| PROFIT | Ownership |
| REIM | Medicaid reimbursement |
| METRO | Metropolitan Areas |
| CON | Certificate of need (CON)/moratoria on new construction |

Notes:
[1] Means contract staffing and contract is defined as individuals under contract as well as organization is under contract.
[2] Means part-time staffing and part-time is defined as less than 35 hours per week.
[3] Means full-time staffing and full-time is defined as 35 or more hours worked per week.

# Appendix C
## Intercorrelation of Study Variables and Test Statistics, 1992-1995
## (Pearson's[1] and Spearman's[2] Correlations)
## (n = 5,884)

| Variables[3] | *PROSUB* | *RN_LPN* | *PH* | *ANCILL* | *OLD* | *CHAIN* | *HOSPBASE* | *REIM* | *PROFIT* | *METRO* | *CON* | *OCC* | *TIME* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PROSUB | 1.0 | | | | | | | | | | | | |
| RN_LPN | 0.067* | 1.0 | | | | | | | | | | | |
| PH | 0.171* | 0.046* | 1.0 | | | | | | | | | | |
| ANCILL | 0.110* | 0.019 | 0.296* | 1.0 | | | | | | | | | |
| OLD | -0.012 | -0.006 | -0.023 | -0.042* | 1.0 | | | | | | | | |
| CHAIN | -0.018 | -0.061* | -0.076* | 0.058* | -0.007 | 1.0 | | | | | | | |
| HOSPBASE | 0.065* | 0.207* | 0.219* | 0.329* | -0.119* | -0.154* | 1.0 | | | | | | |
| REIM | 0.002 | -0.171* | -0.020 | -0.244* | -0.032* | -0.142* | -0.101* | 1.0 | | | | | |
| PROFIT | -0.069* | -0.124* | -0.047* | -0.133* | 0.005 | 0.115* | -0.261* | 0.092* | 1.0 | | | | |
| METRO | 0.066* | 0.097* | 0.141* | 0.127* | 0.018 | -0.008 | -0.049* | -0.129* | -0.061* | 1.0 | | | |
| CON | 0.008 | 0.086* | -0.005 | 0.024 | 0.333 | 0.053* | -0.105* | -0.072* | 0.034* | -0.086* | 1.0 | | |
| OCC | 0.049* | 0.031 | 0.069* | 0.002 | 0.165* | -0.072* | -0.022 | 0.205* | -0.038* | 0.059* | 0.221* | 1.0 | |
| TIME | 0.137* | 0.043* | -0.041* | 0.089* | 0.000 | 0.045* | 0.005 | 0.000 | -0.000 | 0.002 | 0.000 | -0.142* | 1.0 |

Note: [1] Pearson's correlation analysis is used for continuous variables.

[2] Spearman's correlation analysis is used for categorical variables.

[3] Please refer to Appendix B (p.207) for abbreviations of variables and their definitions

* $p < 0.05$.

# Appendix D

## Intercorrelation of Study Variables and Test Statistics, 1992

(Pearson's[1] and Spearman's[2] Correlations)

(n = 1,471)

| Variables[3] | *PROSUB* | *RN_LPN* | *PH* | *ANCILL* | *OLD* | *CHAIN* | *HOSPBASE* | *REIM* | *PROFIT* | *METRO* | *CON* | *OCC* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PROSUB | 1.0 | | | | | | | | | | | |
| RN_LPN | 0.09* | 1.0 | | | | | | | | | | |
| PH | 0.20* | 0.02 | 1.0 | | | | | | | | | |
| ANCILL | 0.12* | 0.02 | 0.26* | 1.0 | | | | | | | | |
| OLD | 0.02 | -0.01 | -0.05* | -0.04 | 1.0 | | | | | | | |
| CHAIN | -0.03 | -0.02 | -0.09* | -0.01 | 0.03 | 1.0 | | | | | | |
| HOSPBASE | 0.11* | 0.09* | 0.17* | 0.13* | -0.11* | -0.17* | 1.0 | | | | | |
| REIM | -0.06* | 0.03 | -0.06* | 0.01 | 0.09* | 0.15* | -0.04 | 1.0 | | | | |
| PROFIT | -0.10* | -0.03 | -0.03 | -0.06* | 0.01 | 0.07* | -0.21 | -0.04 | 1.0 | | | |
| METRO | 0.05 | -0.03 | 0.04 | 0.04 | 0.05 | -0.05 | -0.05 | 0.09* | -0.07* | 1.0 | | |
| CON | -0.004 | -0.02 | -0.04 | -0.05* | 0.23* | 0.07* | -0.10* | 0.08* | 0.03* | -0.08* | 1.0 | |
| OCC | 0.06* | 0.03 | 0.04 | 0.01 | 0.23* | -0.04 | -0.03 | 0.22* | -0.03* | 0.06* | 0.23* | 1.0 |

Note: [1] Pearson's correlation analysis is used for continuous variables.

[2] Spearman's correlation analysis is used for categorical variables.

[3] Please refer to Appendix B (p.207) for abbreviations of variables and their definitions

* $p < 0.05$.

# Appendix E
## Intercorrelation of Study Variables and Test Statistics, 1993
## (Pearson's[1] and Spearman's[2] Correlations)
## (n = 1,471)

| Variables[3] | *PROSUB* | *RN_LPN* | *PH* | *ANCILL* | *OLD* | *CHAIN* | *HOSPBASE* | *REIM* | *PROFIT* | *METRO* | *CON* | *OCC* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PROSUB | 1.0 | | | | | | | | | | | |
| RN_LPN | 0.10* | 1.0 | | | | | | | | | | |
| PH | 0.24* | 0.13* | 1.0 | | | | | | | | | |
| ANCILL | 0.13* | 0.03 | 0.42 | 1.0 | | | | | | | | |
| OLD | -0.03 | -0.007 | -0.04 | -0.03 | 1.0 | | | | | | | |
| CHAIN | -0.06* | -0.08* | -0.01 | -0.01 | 0.01 | 1.0 | | | | | | |
| HOSPBASE | 0.14* | 0.06* | 0.17* | 0.17* | -0.11* | -0.16* | 1.0 | | | | | |
| REIM | -0.14* | -0.03 | 0.01 | 0.01 | 0.09* | 0.12* | -0.12* | 1.0 | | | | |
| PROFIT | -0.09* | -0.02 | -0.09 | -0.09* | 0.01 | 0.08* | -0.25* | 0.003 | 1.0 | | | |
| METRO | 0.05* | 0.01 | 0.05* | 0.05* | 0.06* | -0.01 | -0.05* | 0.07* | -0.05* | 1.0 | | |
| CON | -0.01 | -0.01 | -0.07* | -0.07 | 0.23* | 0.05 | -0.10 | 0.08* | 0.04 | -0.08* | 1.0 | |
| OCC | 0.07* | 0.04 | 0.01 | 0.01 | 0.26* | -0.07* | -0.03 | 0.22* | -0.07* | 0.07* | 0.29* | 1.0 |

Note: [1] Pearson's correlation analysis is used for continuous variables.

[2] Spearman's correlation analysis is used for categorical variables.

[3] Please refer to Appendix B (p.207) for abbreviations of variables and their definitions

* $\underline{p} < 0.05$.

# Appendix F
## Intercorrelation of Study Variables and Test Statistics, 1994
## (Pearson's[1] and Spearman's[2] Correlations)
## (n = 1,471)

| Variables[3] | *PROSUB* | *RN_LPN* | *PH* | *ANCILL* | *OLD* | *CHAIN* | *HOSPBASE* | *REIM* | *PROFIT* | *METRO* | *CON* | *OCC* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PROSUB | 1.0 | | | | | | | | | | | |
| RN_LPN | 0.05 | 1.0 | | | | | | | | | | |
| PH | 0.19* | 0.03 | 1.0 | | | | | | | | | |
| ANCILL | 0.12* | 0.02 | 0.29* | 1.0 | | | | | | | | |
| OLD | -0.02 | -0.002 | -0.01 | -0.05 | 1.0 | | | | | | | |
| CHAIN | -0.06* | -0.09* | -0.06* | -0.03 | 0.004 | 1.0 | | | | | | |
| HOSPBASE | 0.14* | 0.09* | 0.12* | 0.07* | -0.11* | -0.15* | 1.0 | | | | | |
| REIM | -0.20* | -0.003 | -0.07* | 0.02 | 0.09* | 0.13* | -0.12* | 1.0 | | | | |
| PROFIT | -0.09* | -0.09* | -0.05 | -0.07* | 0.01 | 0.12* | -0.27* | 0.01 | 1.0 | | | |
| METRO | 0.05* | 0.03 | 0.03 | 0.03 | 0.06* | -0.01 | -0.05* | 0.07* | -0.06* | 1.0 | | |
| CON | -0.07* | -0.005 | -0.03 | -0.07* | 0.23* | 0.04 | -0.10* | 0.08* | 0.03 | -0.09* | 1.0 | |
| OCC | 0.03 | 0.03 | 0.08* | -0.00 | 0.11* | -0.07* | 0.004 | 0.21* | -0.06* | 0.06* | 0.22* | 1.0 |

Note: [1] Pearson's correlation analysis is used for continuous variables.

[2] Spearman's correlation analysis is used for categorical variables.

[3] Please refer to Appendix B (p.207) for abbreviations of variables and their definitions

* $p < 0.05$.

## Appendix G
## Intercorrelation of Study Variables and Test Statistics, 1995
## (Pearson's[1] and Spearman's[2] Correlations)
## (n = 1,471)

| Variables[3] | *PROSUB* | *RN_LPN* | *PH* | *ANCILL* | *OLD* | *CHAIN* | *HOSPBASE* | *REIM* | *PROFIT* | *METRO* | *CON* | *OCC* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PROSUB | 1.0 | | | | | | | | | | | |
| RN_LPN | 0.02 | 1.0 | | | | | | | | | | |
| PH | 0.11* | 0.03 | 1.0 | | | | | | | | | |
| ANCILL | 0.10* | 0.02 | 0.29* | 1.0 | | | | | | | | |
| OLD | -0.02 | -0.002 | -0.008 | -0.05 | 1.0 | | | | | | | |
| CHAIN | -0.08* | -0.11* | -0.07* | -0.03 | 0.01 | 1.0 | | | | | | |
| HOSPBASE | 0.08* | 0.09* | 0.12* | 0.06* | -0.11* | -0.14* | 1.0 | | | | | |
| REIM | -0.19* | -0.004 | -0.07* | 0.02 | 0.09* | 0.13* | -0.12* | 1.0 | | | | |
| PROFIT | -0.04 | -0.09* | -0.04 | -0.06* | 0.003 | 0.13* | -0.26* | 0.004 | 1.0 | | | |
| METRO | 0.06* | 0.03 | 0.03 | 0.03 | 0.06* | -0.009 | -0.05* | 0.07* | -0.06* | 1.0 | | |
| CON | -0.03 | -0.005 | -0.03 | -0.07* | 0.23* | 0.05 | -0.10* | 0.08* | 0.03 | -0.09* | 1.0 | |
| OCC | 0.09* | 0.02 | 0.08* | 0.007 | 0.09* | -0.05* | -0.003 | 0.23* | -0.06* | 0.07* | 0.21* | 1.0 |

Note: [1] Pearson's correlation analysis is used for continuous variables.

[2] Spearman's correlation analysis is used for categorical variables.

[3] Please refer to Appendix B (p.207) for abbreviations of variables and their definitions

* $p < 0.05$.

# VITA

Shu-Chuan Jennifer Yeh was born on March 28, 1966, in Nantou, Taiwan, Republic of China. She graduated from Taiwan Provincial Taichung Nurse and Midwifery School, Taichung, Taiwan, in 1985, and from Nursing from National Taipei College of Nursing, Taipei, Taiwan, in 1987. She received a Master of Science degree in Health Administration from the University of Scranton, Scranton, Pennsylvania, in 1990. Before entering the doctoral program in Health Services Organization and Research in 1994, Jennifer worked for Cheng-Gung Memorial Hospital in 1990-1991. She served as a full-time instructor in the National Taipei College of Nursing from 1991 to 1994. She and her husband, Martin, have two glorious children, Sarah and Rachel.

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